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SECOND QUARTER MONITORING REPORT

APRIL TO JUNE 2002

KIN-BUC LANDFILL OPERABLE UNITS 1 AND 2

Prepared for

SCA Services, Inc.
Edison Township, Middlesex County, New Jersey

September 2002

Prepared by

EMCON/OWT, Inc.
Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, New Jersey 07495

OWT Project 791186

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EXECUTIVE SUMMARY

The Kin-Buc Landfill Site is a closed 200-acre industrial/commercial landfill located in Edison, New Jersey, which the USEPA placed on the National Priorities List (NPL) in 1981. A Remedial Investigation/Feasibility Study (RI/FS) was conducted between 1983 and 1988 which resulted in a Record of Decision (ROD) by USEPA in 1990 that called for source control of Operable Unit 1 (OU1).

The remedial action specified in the ROD for OU1 included the construction of a slurry wall around OU1, the collection and treatment of leachate and groundwater from within the containment area, and the capping of the area within the slurry wall. Remedial construction activities for OU1 were completed by the end of August 1995.

In accordance with the RODs, hydraulic monitoring and landfill gas monitoring is conducted on a quarterly basis to evaluate the effectiveness of the remedial actions. This report documents the results of the monitoring activities for the Second Quarter of 2002.

Remedial Objectives

The general remedial objectives of the OU1 closure and collection systems are to contain source leachate and contaminated groundwater, and to prevent further migration of site-related contaminants. The primary objective of the leachate collection system is to impose an inward gradient as measured across the slurry wall in the refuse unit. The primary objectives of the groundwater collection system is to prevent migration of contaminated groundwater towards the slurry wall and impose an upward gradient from the bedrock unit to the sand & gravel unit.

Hydraulic Control and Monitoring System

The hydraulic control system for OU1 consists of leachate and groundwater collection systems. The leachate collection system consists of a perforated pipe that runs parallel to the inside of the perimeter slurry wall and 4 pump stations. The groundwater collection system consists of 4 pumping wells.

The hydraulic monitoring system for OU1 is located along the circumferential slurry wall with many of the wells located in 5 clusters, called transects. The hydraulic monitoring wells at the transects are installed in pairs, within the same hydrogeologic unit, with

1 well inside and 1 well outside the circumferential slurry wall. Twenty-four of the monitoring wells are continuously monitored using water level recorders.

The hydraulic monitoring network consists of wells screened in the refuse, sand & gravel, and bedrock units. Well designations of G, S or R; denote hydraulic units of refuse, sand & gravel or bedrock, respectively.

The OU2 hydraulic monitoring well network is located in the Low-Lying Area and Mound B, and monitors groundwater elevations outside of the OU1 containment area.

Second Quarter Hydraulic Monitoring Activities

Manual groundwater elevation measurements were obtained and continuous water level data downloaded from the monitoring wells in OU1 and OU2 during site visits on April 19, 2002, May 3, 2002, June 5, 2002, and July 8, 2002.

Hydraulic monitoring indicates that intragradient conditions in the refuse unit (lower water levels in the refuse inside the wall relative to water levels outside the wall) were maintained at TL Nos. 2, 3, 4 and 5, throughout the quarter. The fact that the leachate collection system is functioning properly suggests that intragradient conditions are being maintained in the refuse unit at TL No. 1, even though water levels in Wells 1G and 2G do not indicate this condition. Water level elevation measurements taken from Leachate Collection Cleanout Nos. 14 through 16 are included in Table 2-6, and indicate that the leachate collection system is functioning properly.

Intragradient conditions in the sand & gravel unit (lower water levels in the sand & gravel unit inside the slurry wall relative to water levels outside the wall) were maintained at TL Nos. 3 and 4, throughout the quarter. Intragradient conditions were not observed in the sand & gravel unit at TL No. 2 throughout the quarter.

Upward gradient conditions between the bedrock and the overlying sand & gravel deposits were consistently observed at only TL No. 4 inside of the slurry wall throughout the quarter. Slight upward gradient conditions between the bedrock and the overlying sand & gravel deposits were observed at TL No. 2 inside of the slurry wall and TL No. 3 outside of the slurry wall throughout the quarter. Based on the average manual water elevations for the quarter, a dominant flow direction was not established between the bedrock and the overlying sand & gravel deposits at TL No. 4 outside of the slurry wall. At TL No. 3 inside of the slurry wall, upward conditions were not observed.

The synoptic groundwater elevations obtained during the Second Quarter of 2002 indicate both upward and downward hydraulic gradients between the different geologic strata.

Leachate Withdrawal/Groundwater Pumping

Groundwater was collected from S&G Wells 1, 2, 3 and 4, at an average rate for the quarter of 16,925 gpd. The total volume of groundwater collected for the quarter was 1,660,431 gallons. Leachate was collected at an average daily rate of 1,524 gpd for the quarter, and the total volume of leachate collected was 137,145 gallons. Both groundwater and leachate collection were generally consistent with recommended withdrawal rates.

Landfill Gas Monitoring

Combustible gas was not detected in any of the 6 gas monitoring wells located on the north side of OU1. Based on the non-detection of combustible gas in the monitoring wells, the active gas collection system is functioning properly and there is no apparent off-site gas migration. Monitoring at the flare inlet port by landfill personnel throughout the quarter indicated that the landfill gas collection system was delivering an average of 42.6 percent combustible gas to the flare.

1 INTRODUCTION

The Kin-Buc Landfill Site is a closed 200-acre industrial/commercial landfill located in Edison, New Jersey, which operated under a New Jersey Department of Environmental Protection (NJDEP) permit until 1976. The USEPA placed the Kin-Buc Landfill on the National Priorities List (NPL) in 1981. Between 1983 and 1988, the Respondents conducted a Remedial Investigation/Feasibility Study (RI/FS) which resulted in a Record of Decision (ROD) by USEPA in 1990 which called for source control of Operable Unit 1 (OU1), and an additional RI/FS to determine the nature and extent of contamination outside the source area, thus defining Operable Unit 2 (OU2).

Operable Unit 1 includes both Kin-Buc I and II Mounds, the former Pool C Area and a portion of the Low-Lying Area between Kin-Buc I and the Edison Landfill. The remedial action specified in the ROD for OU1 included the construction of a slurry wall around OU1, the collection and treatment of leachate and groundwater from within the containment area, and the capping of the area within the slurry wall.

Operable Unit 2 includes Mound B, Edmonds Creek and adjacent wetlands, the remaining Low-Lying Area between OU1 and the Edison Landfill, Martins Creek, and the Raritan River. The OU2 ROD called for the excavation and disposal of PCB-contaminated sediments from within the Edmonds Creek Marsh Area, the restoration of disturbed wetland areas, and groundwater/surface water monitoring.

Remedial construction activities for both OU1 and OU2 were completed by the end of August 1995.

In accordance with the RODs, hydraulic monitoring and landfill gas monitoring is conducted quarterly to evaluate the effectiveness of the remedial actions. This report documents the results of the monitoring activities for the Second Quarter of 2002.

2 DESCRIPTION OF MONITORING PROGRAM

2.1 Hydrogeologic background

The primary hydrogeologic units within OU1 from ground surface downward are refuse, meadow mat, sand & gravel, and bedrock. Near the northern portion of the site the bedrock is closer to the surface and there is no sand & gravel unit in that area.

The southern portion of the site is located in close proximity to the Raritan River. As a result, monitoring wells located on the southern side of OU1 are impacted by tidal fluctuations.

2.2 Remedial Objectives

The general remedial objectives of the OU1 closure and collection systems are to contain source leachate and contaminated groundwater, and to prevent further migration of site-related contaminants. The specific remedial objectives for the leachate collection, groundwater collection, and hydraulic monitoring are summarized as follows:

Aqueous Leachate Collection

- Primary
  - Collect leachate from the refuse unit within the perimeter slurry wall to impose an inward gradient as measured across the slurry wall (hydraulic containment).
- Additional Benefit
  - Reduce the downward gradient between the refuse unit and the underlying sand & gravel or bedrock units.

Sand & Gravel Groundwater Collection (in Primary OU1 Containment)

- Primary
  - Prevent migration of contaminated groundwater towards the slurry wall.
  - Impose an upward gradient from the bedrock unit to the sand & gravel unit (hydraulic containment).
- Additional Benefit
  - Impose an inward gradient within the sand & gravel unit as measured across the perimeter slurry wall (hydraulic containment).

Sand & Gravel Aquifer Groundwater Collection (in Oil Seeps Area Containment)

- Collect sand & gravel groundwater from within the Oil Seeps Area if an upward gradient between the sand & gravel and the refuse units cannot be imposed by leachate collection alone.

2.3 Hydraulic Control and Monitoring System

The hydraulic control system for OU1 consists of 4 leachate pump stations and 4 sand & gravel groundwater pumping wells. The leachate collection system consists of a perforated pipe that runs parallel to the inside of the perimeter slurry wall. In addition, a corrugated oily leachate collection conduit is located along the south side of Kin-Buc I mound. The layout of the collection system is shown on Drawing 1.

The hydraulic monitoring system for Operable Unit 1 is located along the circumferential slurry wall with many of the wells located in 5 clusters, called transects. The OU1 hydraulic monitoring well network consists of 11 wells screened in the refuse/fill, 8 wells screened in the sand & gravel, and 10 wells screened within bedrock. A summary of the well network is provided in Table 2-1, and the well locations are shown on Drawing 1.

The hydraulic monitoring wells at the transects are installed in pairs, within the same hydrogeologic unit, with 1 well inside and 1 well outside the circumferential slurry wall. The design of the well network allows groundwater elevations to be monitored on either side of the slurry wall and provides data to evaluate the performance of the slurry wall as a hydraulic barrier.

At TL Nos. 2, 3 and 4, the hydraulic monitoring wells are installed in the refuse, sand & gravel and bedrock units. At TL Nos. 1 and 5, the hydraulic monitoring wells are installed only in the refuse and bedrock units due to the absence of sand and gravel deposits in these areas. Well designations of G, S and R, denote hydraulic units of refuse, sand & gravel and bedrock, respectively.

The OU2 hydraulic monitoring well network is located in the Low-Lying Area and Mound B, and monitors groundwater elevations outside of the OU1 containment area. The hydraulic monitoring system for OU2 consists of 16 wells, as indicated in Table 2-2 and as shown on Figure 1-1. Water elevation measurements from the OU2 wells are taken manually, concurrent with the OU1 monitoring activities.

2.4 Second Quarter Hydraulic Monitoring Activities

Monitoring and sampling for the Second Quarter of 2002 (April to June) took place according to the procedures and methods outlined in the Draft Operations and Maintenance (O&M) Manual for the Kin-Buc Landfill, prepared on behalf of the Respondents by Wheelabrator EOS in September 1995 and modified by a letter to EPA dated February 28, 1996.

Components of the hydraulic monitoring program consist of continuous and manual water level measurements. Manual measurements were obtained with an electronic water level indicator. Continuous water levels were obtained at 1-hour intervals using 24 In-Situ "miniTROLL", Model SSP-100 data loggers and transducers. The remaining Ten (10) In-Situ "Trolls", Model SP4000 data loggers were upgraded to new In-Situ "miniTROLL", Model SSP-100 data loggers on April 19, 2002.

During the site visit of March 27, 2002, the following Trolls were upgraded with new miniTroll data loggers: Wells 2G, 3G, 3S, 4G, 4S, 5G, 5S, 6R, 8S, 9G, 13S, and 15G. Due to complications with the programming of the new data loggers, data was not collected after the installation date (March 27, 2002) until April 19, 2002 in Wells 2G, 3G, 6R, and 8S. All of the new miniTrolls installed in March were checked during the April 19, 2002 site visit and appear to be operating properly. Also, during the site visit of April 19, 2002, the following Trolls were upgraded with new miniTroll data loggers: Wells 1G, 3RR, 4R, 5R, 6G, 6S, 7R, 7S, 8RR, and 10G. All of the new miniTrolls installed on April 19, 2002 were checked during a site visit of April 29, 2002, and appear to be operating properly with the exception of the miniTroll in Well 5R (inside the wall). The Troll in Well 5R malfunctioned and was sent back to In-Situ for warranty repair and was replaced during a site visit of June 5, 2002. During the site visit of July 8, 2002, the miniTroll in Well 15S (inside the wall) malfunctioned and data was not collected due to unknown reasons. The Troll was removed, and a rental miniTroll was installed in the above mentioned well on July 19, 2002.

Manual groundwater elevation measurements were obtained from the monitoring wells in OU1 and OU2 during site visits on April 19, May 3, and June 5, 2002. The manually recorded water level monitoring results are provided in Table 2-3.

Three months of continuous water level data have been obtained from the refuse and sand & gravel wells at the site from April 1, 2002 to June 30, 2002. The minimum and maximum recorded water elevations for each month in the quarter are provided in Table 2-4. Continuous groundwater elevation graphs organized by transect location and hydrogeologic unit are provided in Appendix A. Evaluations of the recorded data are performed on a monthly basis. Copies of these monthly evaluations are provided in Appendix B.

2.5 Continuous Hydraulic Monitoring Results vs. Manual Elevation Measurements

The continuous water level monitoring information collected by the Trolls was compared with the data collected from the 3 manual recordings to provide information on the relative accuracy of manual versus automatic recordings. Table 2-5 shows the difference between the 3 manual water level elevation measurements and Troll recordings for the same day and hour. Differences between the manual and continuous measurements were below 0.3 feet for all wells. Based on the comparison above, the data recorded by the Trolls is satisfactory and reflects accurate groundwater elevations.

3 HYDRAULIC MONITORING

A summary of the Second Quarter hydraulic profile is provided in Figure 3-1. Intragradient conditions in the refuse unit (lower water levels in the refuse inside the wall relative to water levels outside the wall) were maintained at TL Nos 2, 3, 4, and 5 throughout the quarter. Intragradient conditions in the sand & gravel unit (lower water levels in the sand & gravel unit inside the slurry wall relative to water levels outside the wall) were maintained at TL Nos. 3 and 4 throughout the quarter. The average flow condition in the sand & gravel unit at TL No. 2 was intragradient throughout the quarter, although there were periods where intragradient conditions were not observed. In the sand & gravel unit at TL No. 4 Oil Seeps Area, intragradient conditions were not observed, although there were periods where intragradient conditions were maintained. Upward gradient conditions between the bedrock and the overlying sand & gravel deposits were maintained at only TL No. 4 inside of the slurry wall throughout the quarter. Upward gradient conditions between the bedrock and the overlying sand & gravel deposits were maintained at TL No. 2 inside of the slurry wall and at TL No. 3 outside of the slurry wall throughout the quarter, although there were periods where intragradient conditions were not observed. A dominant flow direction was not observed between the bedrock and the overlying sand & gravel deposits at TL Nos. 2 and 4 outside of the slurry wall throughout the quarter. The detailed analysis of the hydraulic conditions at each transect in the various hydrogeologic units is provided below.

3.1 Assessment of Hydraulic Conditions in the Refuse Unit

Hydrographs 1 through 5 located in Appendix A show the continuous water levels in the refuse wells at TL Nos. 1 through 5. The heavier weight line denotes wells located outside the slurry wall. A straight line on the hydrograph signifies that the water levels were below the range on the Troll. The hydrographs show that intragradient conditions (lower water levels in the refuse inside the wall relative to water levels outside the wall) were maintained at TL Nos. 2, 3, 4, and 5 throughout the quarter. A detailed analysis of each of the TL is provided below.

TL No. 1 (Well 1G/Well 2G)

Intragradient conditions were not consistently observed throughout the quarter, although they were evident throughout May 2002. The average quarterly water elevations for

Wells 1G (inside) and 2G (outside) were 11.07 and 11.35 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.3 feet in an inward direction. High water levels in Well 1G have been observed on several previous occasions and may be related to localized conditions around the well.

Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 2-6, and indicate that the leachate collection system is functioning properly. The water level elevations observed for Leachate Collection Cleanouts 14 through 15 are all between 9.54 and 10.50 feet msl, and the water level elevations for Cleanouts 16N and 16E were dry (less than the cleanouts invert elevation). This indicates that groundwater flow at this location is from the inside to the Leachate Collection Cleanouts. The leachate collection system is therefore functioning properly and suggests that intragradient conditions are being maintained at Transect 1, even though water levels in Well 1G do not indicate this condition.

TL No. 2 (Well 3G/Well 4G)

Intragradient conditions were maintained at TL No. 2 in the refuse unit throughout the quarter. The average quarterly water elevations for Wells 3G (inside) and 4G (outside) were 9.85 and 11.19 feet msl, respectively. The average head elevation difference between the two wells was approximately 1.3 feet in an inward direction.

TL No. 3 (Well 5G/Well 6G)

Intragradient conditions were maintained at TL No. 3 in the refuse unit throughout the quarter. The average quarterly water elevations for Wells 5G (inside) and 6G (outside) were 10.10 and 13.23 feet msl, respectively. The head elevation difference between the two wells was approximately 3.1 feet in an inward direction.

TL No. 4 Well 15G/Well 13G) Oil Seeps Area

Intragradient conditions were maintained at TL No. 4, Oil Seeps Area, in the refuse unit throughout the quarter. The average quarterly water elevations for Wells 15G (inside) and 13G (outside) were 1.42 and 6.67 feet msl, respectively. The head elevation difference between the two wells was approximately 5.2 feet in an inward direction. These readings suggest significant intragradient conditions are being maintained at this location.

TL No. 5 (Well 9G/Well 10G)

Intragradient conditions were maintained at TL No. 5 in the refuse unit throughout the quarter. The average quarterly water elevations for Wells 9G (inside) and 10G (outside) were 7.32 and 8.21 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.9 feet in an inward direction.

3.2 Assessment of Hydraulic Conditions in the Sand & Gravel Unit

Hydrographs 6 through 9 located in Appendix A, show the continuous water levels in the sand & gravel wells at TL Nos. 2 through 4. The water levels in the wells on the outside of the slurry wall vary significantly over the course of the day due to the tidal influence at the site. For clarity, Hydrographs 6 through 9 show the average water level in the well over a 24-hour period (12 hours before and 12 hours after). The heavier weight line on the hydrograph denotes wells located outside the slurry wall.

TL No. 2 (Well 3S/Well 4S)

Intragradient conditions were not consistently observed throughout the quarter, although there were periods where intragradient conditions were maintained. The average quarterly water elevations for Wells 3S (inside) and 4S (outside) were 0.66 and 0.86 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.2 feet in an inward direction.

TL No. 3 (Well 5S/Well 6S)

Intragradient conditions were maintained at TL No. 3 in the sand & gravel unit throughout the quarter. The average quarterly water elevation for Wells 5S (inside) and 6S (outside) were 1.34 and 1.43 feet msl, respectively. The head elevation difference between the two wells was approximately 0.09 feet in an inward direction.

TL No. 4 (Well 7S/Well 8S)

Intragradient conditions were maintained at TL No. 4 in the sand & gravel unit throughout the quarter. The average quarterly water elevation for Wells 7S (inside) and 8S (outside) was 1.61 and 2.42 feet msl, respectively. The head elevation difference between the two wells was approximately 0.8 feet in an inward direction.

TL No. 4 (Well 15S/Well 13S) Oil Seeps Area

Intragradient conditions were not consistently maintained at TL No. 4 Oil Seeps Area in the sand & gravel unit throughout the quarter. The average quarterly water elevations for Wells 15S (inside) and 13S (outside) were 2.20 and 2.17 feet msl, respectively. The head elevation difference between the two wells was approximately 0.03 feet. It should be noted that upward gradient conditions exist between the sand & gravel and refuse units in the oil seeps area.

3.3 Assessment of Vertical Hydraulic Gradients

Hydrographs 10 through 15 located in Appendix A show the continuous water levels in the sand & gravel and bedrock wells at TL Nos. 2 through 4. The water levels in the bedrock wells vary significantly over the course of the day due to the tidal influence at the site. For clarity, the hydrographs show the average water level in the well over a 24-hour period (12 hours before and 12 hours after). The heavier weight line on the hydrograph denotes wells located in the bedrock unit.

Throughout the quarter, upward gradient conditions between the bedrock and the overlying sand & gravel deposits was only observed at TL No. 4 inside of the slurry wall. A detailed analysis of each of the TLs is provided below.

TL No. 2 (Well 3S/Well 3RR) – Inside; (Well 4S/Well 4R) - Outside

Upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 2 throughout the quarter. The average quarterly water elevation for Well 3S (sand & gravel) and 3RR (bedrock) was 0.66 and 0.93 feet msl, respectively. The difference in average quarterly water elevations was approximately 0.3 feet in an upward direction.

A dominant flow direction between the bedrock and overlying sand & gravel units outside the slurry wall at TL No. 2 was not observed throughout the quarter. The average quarterly water elevation for Wells 4S (sand & gravel) and 4R (bedrock) was 0.86 and 0.79 feet msl, respectively. The difference in average quarterly water elevations was less than 0.2 feet.

TL No. 3 (Well 5S/Well 5R) – Inside; (Well 6S/Well 6R) - Outside

Inside the slurry wall at TL No. 3, upward gradient conditions were not observed between the bedrock and overlying sand & gravel units. The miniTroll malfunctioned, and data was not collected between April 19 and June 5. Data collected before and after with the miniTroll, indicate a flow from sand & gravel to bedrock. Verification of this was achieved with a review of manual water levels obtained for each month. The average quarterly water elevations for Wells 5S (sand & gravel) and 5R (bedrock) were 1.34 and 1.50 feet msl, respectively. The difference in average quarterly water elevations was less than 0.2 feet.

Outside the slurry wall at TL No. 3, upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units. During the month of April, flow conditions were from sand & gravel to bedrock. However, during the months of May and June a slight but consistent upward flow component from the bedrock to the sand & gravel was observed. The average quarterly water elevations for wells 6S (sand & gravel) and 6R (bedrock) were 1.43 and 1.35, respectively. The difference in average quarterly water elevations was less than 0.1 feet.

TL No. 4 (Well 7S/Well 7R) – Inside; (Well 8S/Well 8RR) - Outside

Slight upward gradient conditions were maintained between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 4 throughout the quarter. The average quarterly water elevations for Wells 7S (sand & gravel) and 7R (bedrock) were 1.61 and 1.69 feet msl, respectively. The difference in average quarterly water elevations was less than 0.1 feet.

Outside the slurry wall at TL No. 4, upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units, although the average water elevations indicate a very slight upward gradient condition. Because the average water elevations are so close, a dominant flow direction cannot be established. The average quarterly water elevations for Wells 8S (sand & gravel) and 8RR (bedrock) were 2.41 feet and 2.42 feet msl, respectively. The difference in average quarterly water elevations was 0.01 feet.

Hydrograph 9 also contains the continuous water level elevations for Well 15G in the refuse unit. Upward gradient conditions were maintained across the meadow mat between the sand & gravel and refuse units in the Oil Seeps Area throughout the quarter. The average quarterly water elevations for Wells 15S (sand & gravel unit) and 15G (refuse unit) were 2.20 and 1.42 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.78 feet in an upward direction.

3.4 OU2 Hydraulic Monitoring

The synoptic groundwater elevations obtained during the Second Quarter of 2002 indicate both upward and downward hydraulic gradients.

Downward hydraulic gradients prevail between the refuse and the underlying sand & gravel. Downward hydraulic gradients were only noted between the overlying sand & gravel and bedrock units at WE-3S/WE-3R on May 3 and June 5; WE-5S/WE-5R on April 19, May 3 and June 5; GEI-6S/WE-6R on April 19 and June 5.

4 LEACHATE WITHDRAWAL/GROUNDWATER PUMPING

The performance of the site hydraulic controls is largely dependent upon groundwater pumping and leachate withdrawal rates. The design aqueous leachate and groundwater (GW) collection rates called for a ratio of 3:1, groundwater to leachate of 30,000 gpd groundwater, and 10,000 gpd leachate. The collection rates differed from the design rates due to variations between design assumptions and actual site conditions. Collection rates are also adjusted based on changing site and operational conditions.

A groundwater pumping well performance evaluation was conducted in January and February of 2000 to evaluate the performance of the groundwater collection system in the sand and gravel. According to the Groundwater Pumping Well Performance Evaluation Report, prepared by IT Corporation in September 2000, hydraulic control of OU1 can be achieved by pumping S&G-2 and S&G-3 at a combined rate ranging from 10,000 to 15,000 gpd, with S&G-2 pumped at twice the flow rate of S&G-3. Based on the above recommendation, S&G-2 should be pumped at 10,000 gpd and S&G-3 pumped at 5,000 gpd. The consistent attainment of intragradient conditions has not been achievable.

On June 12, 2002 a meeting was held at the site with U.S. Filter and MWO Environmental Engineering & Consulting, P.C. to discuss the hydraulic performance of OU1. As documented in a letter dated June 18, 2002, it was determined that groundwater extraction of S&G-2 would be increased to approximately 15 gpm while maintaining the rate of well S&G-3 at approximately 6 gpm (approximately 30,000 gpd in total versus the originally recommended rate of 15,000 gpd). It was recommended that this rate be maintained for a minimum of 2 weeks to achieve stabilization. Thereafter, if hydraulic controls are maintained the pumping rates can be scaled back accordingly, based on the results of monthly monitoring.

Leachate collection rates should maintain a leachate level low enough to achieve intragradient conditions and high enough to allow for the collection of oil. Based on the operational history, a leachate collection rate of 1,500 gpd is recommended to maintain intragradient conditions.

Operation records are maintained at the site and contain estimated daily averages for leachate and groundwater withdrawal. The monthly volumes collected and the daily average collection rate are provided below:

Monitoring Period	Groundwater S&G No. 1	Groundwater S&G No. 2	Groundwater S&G No. 3	Groundwater S&G No. 4	Leachate
April	48,756 gal.	222,538 gal.	125,369 gal.	7,672 gal.	36,694 gal.
	1,625 gpd	7,418 gpd	4,179 gpd	256 gpd	1,223 gpd
May	143,665 gal.	99,143 gal.	276,940 gal.	0 gal.	51,825 gal.
	4,634 gpd	3,198 gpd	8,934 gpd	0 gpd	1,672 gpd
June	0 gal.	457,022 gal.	142,181 gal.	0 gal.	48,626 gal.
	0 gpd	15,234 gpd	4,739 gpd	0 gpd	1,621 gpd
Quarter	**192,421 gal.**	**778,703 gal.**	**544,490 gal.**	**7,672 gal.**	**137,145 gal.**
	2,138 gpd	**8,652 gpd**	**6,050 gpd**	**85 gpd**	**1,524 gpd**

The volume of groundwater collected in the second quarter is 1,523,286 gallons. The average daily groundwater withdrawal rate for the second quarter is 16,925 gpd. During the quarter, the average daily withdrawal rate from S&G No. 2 met the originally recommended extraction rate of 10,000 gpd for the month of June, but was below the recommended rate for the months of April and May. The average daily withdrawal rate from S&G No. 3 met the originally recommended extraction rate of 5,000 gpd for the month of May, but was below the recommended rate for the months of April and June. However, as indicated above, groundwater collection rates are being re-evaluated and recommendations for revised pumping rates will be made in the 3rd quarter monitoring report, as applicable. The leachate collection rate of 1,524 gpd does meet the recommended rate of 1,500 gpd.

5 LANDFILL GAS MIGRATION MONITORING

Landfill gas migration monitoring was performed at the operational flare port inlet and the 6 gas migration monitoring wells located along the northern edge of the landfill boundary.

5.1 Landfill Gas Migration

The purpose of the gas migration monitoring program is to monitor for off-site gas migration in those areas where gas migration or accumulation could lead to explosive conditions. Six gas migration monitoring wells are located outside of the circumferential slurry wall along the northern edge of the landfill boundary. The well locations are depicted on Drawing 1 and are spaced in 200-foot increments.

All areas of OU1 exterior to the slurry wall contain waste materials except along the northern edge of the landfill boundary. High levels of gas are not expected to be detected along the northern boundary because the slurry wall will act as an effective barrier, and the presence of an active gas extraction system and the high water table will inhibit gas migration.

Gas monitoring in other areas of the site containing waste materials will likely reveal combustible gas. However, since no on-site OU1 buildings are present (except the leachate treatment facility, which has its own engineered gas monitoring and control system), gas migration monitoring in the waste areas is not required by the O&M manual.

5.2 Gas Monitoring Well Results

Measurements of percent combustible gas (% GAS) and percent lower explosive limit (% LEL) were performed in the 6 gas migration monitoring wells along the northern boundary of the site on May 3, 2002. The wells were monitored in accordance with Attachment 1, Section 3.0 - Routine Operations and Maintenance of the Kin-Buc Landfill Draft O&M Manual (Wheelabrator, 1995). A Landtec GEM 500 sampling device was used to measure the concentration of combustible gas at each well by attaching the meter's sample tubing to the well head petcock and drawing the sample through the meter. Detectable levels of percent combustible gas and percent lower explosive limit were not observed in any gas monitoring wells. The results for the 6 gas migration monitoring wells are shown in Table 5-1.

5.3 Operational Flare Monitoring Results

The percent combustible gas by volume (% methane) at the landfill's operational flare port inlet was recorded throughout the second quarter of 2002. All readings were collected with a Landtec GEM 500 Gas Analyzer, equipped with a charcoal filter. Monitoring performed on May 3, 2002 revealed combustible gas at 50.2 percent at the flare port inlet.

The following summarizes the flare station operation during the Second Quarter of 2002:

Date	Gas Flow (SCFM)	Methane % by volume
4/8//02	104	37.8
4/19/02	105	50.1
5/6/02	108	52.0
5/20/02	107	47.7
6/3/02	102	49.7
6/28/02	104	58.0
Averages for Second Quarter	105	49.2

Note: Flare station data provided by Landfill personnel.

6 CONCLUSIONS

Significant conclusions for the Second Quarter of 2002 monitoring program are as follows:

- In the refuse unit, intragradient conditions were maintained over the entire quarter at Transects 2, 3, 4, and 5. An average daily leachate extraction rate of 1,524 gpd was collected.

- Intragradient conditions were not indicated by the monitoring wells in the refuse unit at Transect 1, although there is evidence that intragradient conditions may be present at this location.

- In the sand and gravel, intragradient conditions were maintained at TL Nos. 3 and 4 over the entire quarter.

- An upward gradient across the meadow mat (between the sand & gravel and refuse units) was imposed at TL No. 4 in the Oil Seeps Area by leachate collection; therefore, intragradient conditions do not need to be maintained in the sand & gravel unit.

- Upward gradient conditions between the bedrock and the overlying sand & gravel deposits were consistently observed at only TL No. 4 inside of the slurry wall throughout the quarter. Upward gradient conditions between the bedrock and the overlying sand & gravel deposits were observed during April and May 2002 at TL No. 2 inside of the slurry wall. Based on the average manual water elevations for the quarter, a dominant flow direction was not established between the bedrock and the overlying sand & gravel deposits at TL Nos. 2 and 4 outside of the slurry wall. Downward gradient conditions were observed at TL No. 3, inside of the slurry wall.

- The volume and rate of groundwater collection partially met the recommended extraction rate for previously recommended levels, for the second quarter of 2002. However, in a letter dated June 18, 2002 it was determined that groundwater extraction of S&G-2 would be increased to approximately 15 gpm while maintaining the rate of well S&G-3 at approximately 6 gpm. It was recommended that this rate be maintained for a minimum of 2 weeks to achieve stabilization. Thereafter, if hydraulic controls are maintained the pumping rates can be scaled back accordingly, based on the results of monthly monitoring.

- Combustible gas as a percent of total gas and the lower explosive limit was not detected in the 6 monitoring wells located on the northern boundary of the site. The flare was operational and the average percent methane for the quarter at the flare port inlet was 49.2 percent. Based on the non-detection of combustible gas in the monitoring wells, the active gas collection system is functioning properly and there is no off-site gas migration.

REFERENCES

Proposed Groundwater Monitoring Plan for the Kin-Buc Landfill Operable Unit 1 RD/RA, Wehran Engineering Corporation, Middletown, New York, December 1992.

Final Addendum 1 to the Proposed Groundwater Monitoring Plan for the Kin-Buc Landfill Operable Unit 1 Closure Plan Re: OU2 Groundwater and Surface Water Monitoring, Wehran Engineering Corporation, Middletown, New York, August 1994.

Draft Operations and Maintenance Manual for the Kin-Buc Landfill, Wheelabrator EOS, Inc., Pittsburgh, PA, August 1995.

Remedial Action Report for Operable Unit 2 for the Kin-Buc Landfill Superfund Site, Blasland, Bouck & Lee, Inc., January 1996.

Appendix C Groundwater, Surface Water, Wetlands and Biota Monitoring Plans for the Kin-Buc Landfill Operable Units 1 and 2, Wheelabrator EOS, Inc., Pittsburgh, PA, August 1995.

Remedial Action Report Volume I Remedial Action Report, Tables, Appendices A1-A5 for the Kin-Buc Landfill Operable Unit 1, Blasland, Bouck & Lee, Inc., September 1995, Revised February 1996.

Draft Remedial Investigation Report for Kin-Buc Landfill Operable Unit 2, Wehran Engineering Corporation, Middletown, New York, October 1990.

Influent Equalization Logs, (Wheelabrator), Inc., Kin-Buc Landfill Treatment Plant, January 1997, February 1997, March 1997.

Kin-Buc Landfill Leachate Treatment Plant Operation and Site Post-Closure Care, Monthly Reports, Wheelabrator EOS, April, May, June 1997.

Groundwater Pumping Well Performance Evaluation Report, IT Corporation, July 2000.

TABLES

Table 2-1

Kin-Buc Landfill
Operable Unit 1
Continuous Hydraulic Monitoring Well Network/Transects

Transect Location No.	Screened Hydrogeologic Unit	Well Location Inside Slurry Wall	Well Location Outside Slurry Wall
1	Refuse/Fill	W-1G	W-2G
2	Refuse/Fill	W-3G	W-4G
	Sand and Gravel	W-3S	W-4S
	Bedrock	W-3RR	W-4R
3	Refuse/Fill	W-5G	W-6G
	Sand and Gravel	W-5S	W-6S
	Bedrock	W-5R	W-6R
4	Refuse/Fill(1)	W-15G	W-13G
	Sand and Gravel(1)	W-15S	W-13S
	Sand and Gravel(2)	W-7S	W-8S
	Bedrock(2)	W-7R	W-8RR
5	Refuse/Fill	W-9G	W-10G

Notes: (1) Wells located across the extended slurry wall.
(2) Wells located across the OU1 circumferential slurry wall.

Table 2-2

Kin-Buc Landfill
Operable Unit 2
Hydraulic Monitoring Network

Well Location	Screened Hydrogeologic Unit
Low-Lying Area	
GEI-10G	Fill/Refuse
WE-10S	Sand & Gravel
WE-10R	Bedrock
GEI-3G	Fill/Refuse
WE-3S	Sand & Gravel
WE-3R	Bedrock
Mound B	
GEI-5G	Fill/Refuse
WE-5S	Sand & Gravel
WE-5R	Bedrock
GEI-6G	Fill/Refuse
GEI-6S	Sand & Gravel
WE-6R	Bedrock
GEI-7G	Fill/Refuse
WE-7S	Sand & Gravel
WE-7R	Bedrock
Upgradient	
WE-114DR	Bedrock

Table 2-3
KinBuc Landfill Operable Units 1 and 2
Modified Monitoring Program
Second Quarter 2002
Manually Recorded Water Level Elevations

Well ID	TOC Bottom	TOC Ref Elevation	April 19, 2002		May 3, 2002		June 5, 2002	
			TOC Static	Elevation	TOC Static	Elevation	TOC Static	Elevation
OU1								
W-1G	20.50	30.78	19.73	11.05	19.71	11.07	19.70	11.08
W-1R	35.34	30.79	20.61	10.18	20.69	10.10	20.65	10.14
W-2G	20.38	30.77	Dry	<10.39	19.79	10.98	19.93	10.84
W-2R	35.33	30.64	23.91	6.73	23.72	6.92	23.76	6.88
W-3G (oil)	19.07	20.73	10.90	9.83	10.99	9.74	11.11	9.62
W-3G	19.07	20.73	12.41	8.32	10.70	10.03	10.81	9.92
W-3S	31.48	20.79	20.60	0.19	21.97	-1.18	19.34	1.45
W-3RR	54.40	21.16	19.80	1.36	21.98	-0.82	19.99	1.17
W-4G	17.57	20.23	8.94	11.29	9.05	11.18	8.92	11.31
W-4S	31.58	19.71	18.65	1.06	19.74	-0.03	18.95	0.76
W-4R	54.92	20.61	19.61	1.00	9.90	10.71	19.94	0.67
W-5G	24.36	23.94	13.63	10.31	13.82	10.12	13.80	10.14
W-5S	30.33	24.33	23.34	0.99	23.50	0.83	22.69	1.64
W-5R	41.64	24.11	23.28	0.83	23.50	0.61	23.22	0.89
W-6G	23.99	23.69	11.14	12.55	10.52	13.17	10.52	13.17
W-6S	38.49	24.00	22.58	1.42	22.90	1.10	22.29	1.71
W-6R	50.43	23.99	23.45	0.54	22.81	1.18	22.21	1.78
W-7G	19.91	18.30	7.91	10.39	8.11	10.19	8.10	10.20
W-7S	29.34	11.61	10.10	1.51	10.37	1.24	9.81	1.80
W-7R	45.13	11.05	9.45	1.60	9.70	1.35	9.14	1.91
W-8S	28.86	10.92	8.57	2.35	8.73	2.19	8.88	2.04
W-8RR	41.60	9.51	7.29	2.22	7.34	2.17	7.49	2.02
W-9G	21.93	27.34	19.96	7.38	19.88	7.46	20.00	7.34
W-9R	39.05	27.68	21.25	6.43	21.35	6.33	21.48	6.20
W-10G	22.56	27.43	19.22	8.21	19.28	8.15	19.16	8.27
W-10R	34.01	27.43	19.54	7.89	19.45	7.98	19.57	7.86
W-13G	10.30	10.17	4.13	6.04	3.50	6.67	3.55	6.62
W-13S	29.32	10.10	7.95	2.15	8.06	2.04	8.13	1.97
W-15G(1)	16.99	16.18	15.44	0.74	14.83	1.35	14.76	1.42
W-15S	33.36	16.05	13.99	2.06	14.03	2.02	13.95	2.10
OU2								
GEI-10G	13.91	13.65	0.85	12.80	1.01	12.64	0.99	12.66
WE-10S	29.57	14.99	13.47	1.52	13.74	1.25	13.42	1.57
WE-10R	41.74	13.96	12.39	1.57	12.67	1.29	12.38	1.58
GEI-3G	13.54	16.73	4.15	12.58	4.25	12.48	4.27	12.46
WE-3S	25.67	15.12	14.12	1.00	14.50	0.62	13.99	1.13
WE-3R	46.51	14.99	13.94	1.05	14.59	0.40	14.05	0.94
GEI-5G	14.60	16.08	9.34	6.74	9.29	6.79	9.02	7.06
WE-5S	25.84	15.04	13.80	1.24	14.38	0.66	14.18	0.86
WE-5R	49.64	15.31	14.21	1.10	14.92	0.39	14.51	0.80
GEI-6G	14.97	19.76	11.78	7.98	11.87	7.89	11.65	8.11
GEI-6S	43.67	20.99	20.11	0.88	20.57	0.42	19.59	1.40
WE-6R	47.12	19.62	19.03	0.59	18.52	1.10	18.55	1.07
GEI-7G	13.74	17.23	Dry	<3.49	Dry	<3.49	Dry	<3.49
WE-7S	30.07	15.86	15.07	0.79	15.88	-0.02	15.77	0.09
WE-7R	72.88	15.93	14.90	1.03	15.69	0.24	15.55	0.38
WE-114DR	44.84	23.76	17.39	6.37	17.58	6.18	18.23	5.53

NOTE:
(1) All level, reference, bottom measurements recorded to the top of PVC inner casing.

Table 2-4
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2002 Minimum/Maximum Water Elevations
Second Quarter

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-1G	April	11.07	11.16	11.07	W-2G	April	10.57	10.58	10.58
	May	11.07	11.08	11.07		May	10.57	13.72	12.30
	June	11.07	11.07	11.07		June	10.49	11.46	10.65
	2nd qtr	11.07	11.16	11.07		2nd qtr	10.49	13.72	11.35
W-3G	April	9.74	10.24	9.93	W-4G	April	10.88	11.32	11.16
	May	9.59	10.14	9.84		May	10.93	11.51	11.22
	June	9.56	10.02	9.84		June	10.79	11.54	11.17
	2nd qtr	9.56	10.24	9.85		2nd qtr	10.79	11.54	11.19
W-3S	April	-0.13	1.96	0.92	W-4S	April	-0.41	2.44	0.92
	May	-2.51	1.58	0.02		May	-0.90	2.26	0.65
	June	0.12	1.88	1.06		June	-0.27	2.57	1.00
	2nd qtr	-2.51	1.96	0.66		2nd qtr	-0.90	2.57	0.86
W-5G	April	9.85	10.59	10.16	W-6G	April	12.85	13.70	13.24
	May	9.76	10.53	10.10		May	12.84	13.87	13.39
	June	9.81	10.28	10.03		June	12.68	13.48	13.06
	2nd qtr	9.76	10.59	10.10		2nd qtr	12.68	13.87	13.23
W-5S	April	0.78	2.27	1.43	W-6S	April	0.86	2.34	1.51
	May	-0.14	1.93	1.04		May	0.17	2.01	1.18
	June	0.77	2.34	1.56		June	0.89	2.43	1.62
	2nd qtr	-0.14	2.34	1.34		2nd qtr	0.17	2.43	1.43
W-7S	April	1.21	2.37	1.69	W-8S	April	2.01	4.45	2.53
	May	0.15	2.12	1.30		May	1.67	4.09	2.33
	June	1.23	2.47	1.84		June	1.85	4.48	2.46
	2nd qtr	0.15	2.47	1.61		2nd qtr	1.67	4.48	2.42
W-15S	April	1.71	3.15	2.14	W-13S	April	1.63	3.48	2.15
	May	1.33	3.10	2.06		May	1.45	3.01	2.05
	June 1 - 23	1.34	3.37	2.41		June	1.77	3.55	2.30
	2nd qtr	1.33	3.37	2.20		2nd qtr	1.45	3.55	2.17
W-15G	April	1.31	1.50	1.41	W-13G	April	6.52	7.03	6.70
	May	1.27	1.50	1.40		May	6.49	7.01	6.73
	June	1.32	1.51	1.44		June	6.36	6.80	6.59
	2nd qtr	1.27	1.51	1.42		2nd qtr	6.36	7.03	6.67
W-9G	April	7.16	7.48	7.33	W-10G	April	8.02	8.19	8.12
	May	6.95	7.46	7.18		May	8.07	8.25	8.16
	June	7.27	7.63	7.45		June	8.24	8.42	8.34
	2nd qtr	6.95	7.63	7.32		2nd qtr	8.02	8.42	8.21

Table 2-4
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2002 Minimum/Maximum Water Elevations
Second Quarter

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-3RR	April	-0.31	3.35	1.77	W-4R	April	-0.70	2.50	0.86
	May	-1.91	1.78	0.21		May	-1.23	2.18	0.55
	June	-0.34	2.15	0.85		June	-0.44	2.57	0.96
	2nd qtr	-1.91	3.35	0.93		2nd qtr	-1.23	2.57	0.79
W-5R	April	0.65	2.26	1.43	W-6R	April	0.28	1.43	0.77
	May	NA (1.)	NA (1.)	0.61 (2.)		May	0.25	2.06	1.21
	June	0.71	2.31	1.55		June	1.01	2.50	1.72
	2nd qtr	0.65	2.31	1.50		2nd qtr	0.25	2.50	1.35
W-7R	April	1.27	2.41	1.76	W-8RR	April	1.84	4.41	2.38
	May	0.24	2.22	1.39		May	1.67	4.08	2.33
	June	1.34	2.58	1.94		June	1.92	4.53	2.52
	2nd qtr	0.24	2.58	1.69		2nd qtr	1.67	4.53	2.41

Note: 1. Troll malfunctioned, data was not collected
2. Water elevation calculated from manual water levels.

Table 2-5
KinBuc Landfill Operable Unit 1
Second Quarter 2002
Troll Water Level Elevations vs. Manual Water Elevations

OU 1	April 19, 2002			May 3, 2002			June 5, 2002			Average
Well ID	Troll	Manual	Difference	Troll	Manual	Difference	Troll	Manual	Difference	Difference
W-1G	11.07	11.05	0.02	11.07	11.07	0.00	11.07	11.08	-0.01	0.00
W-2G	10.58	<10.39	NA	11.01	10.98	0.03	10.84	10.84	0.00	0.01
W-3G	10.01	9.83	0.18	9.79	10.03	-0.24	9.71	9.71	0.00	-0.02
W-3S	0.21	0.19	0.02	-1.22	-1.18	-0.04	1.42	1.45	-0.03	-0.02
W-3RR	1.34	1.36	-0.02	-0.84	-0.82	-0.02	1.14	1.17	-0.03	-0.02
W-4G	11.32	11.29	0.03	11.18	11.18	0.00	11.20	11.13	0.07	0.03
W-4S	1.08	1.06	0.02	-0.03	-0.03	0.00	0.81	0.76	0.05	0.02
W-4R	0.98	1.00	-0.02	0.07	0.71	-0.64	0.65	0.67	-0.02	-0.23
W-5G	10.33	10.31	0.02	10.05	10.12	-0.07	10.07	10.14	-0.07	-0.04
W-5S	1.07	0.99	0.08	0.81	0.83	-0.02	1.65	1.64	0.01	0.02
W-5R	0.84	0.83	0.01	NA (1)	0.61	NA	NA (1)	0.89	NA	0.01
W-6G	12.53	12.55	-0.02	13.20	13.17	0.03	13.16	13.17	-0.01	0.00
W-6S	1.25	1.42	-0.17	1.07	1.10	-0.03	1.66	1.71	-0.05	-0.08
W-6R	0.53	0.54	-0.01	1.17	1.18	-0.01	1.79	1.78	0.01	0.00
W-7S	1.46	1.51	-0.05	1.25	1.24	0.01	1.77	1.80	-0.03	-0.02
W-7R	1.51	1.60	-0.09	1.34	1.35	-0.01	1.87	1.91	-0.04	-0.05
W-8S	2.44	2.35	0.09	2.36	2.19	0.17	2.09	2.04	0.05	0.10
W-8RR	2.24	2.22	0.02	2.19	2.17	0.02	2.07	2.02	0.05	0.03
W-9G	7.37	7.38	-0.01	7.44	7.46	-0.02	7.32	7.34	-0.02	-0.02
W-10G	8.18	8.21	-0.03	8.50	8.15	0.35	8.26	8.27	-0.01	0.10
W-13G	6.09	6.04	0.05	6.69	6.67	0.02	6.61	6.62	-0.01	0.02
W-13S	2.18	2.15	0.03	2.06	2.04	0.02	1.97	1.97	0.00	0.02
W-15G	0.74	0.74	0.00	1.39	1.35	0.04	1.42	1.42	0.00	0.01
W-15S	2.02	2.06	-0.04	2.06	2.02	0.04	2.20	2.10	0.10	0.03

Notes : (1) Troll data was not collected due to device malfunction.

Table 2-6
Kin-Buc Landfill
Leachate Cleanout Monitoring
2002

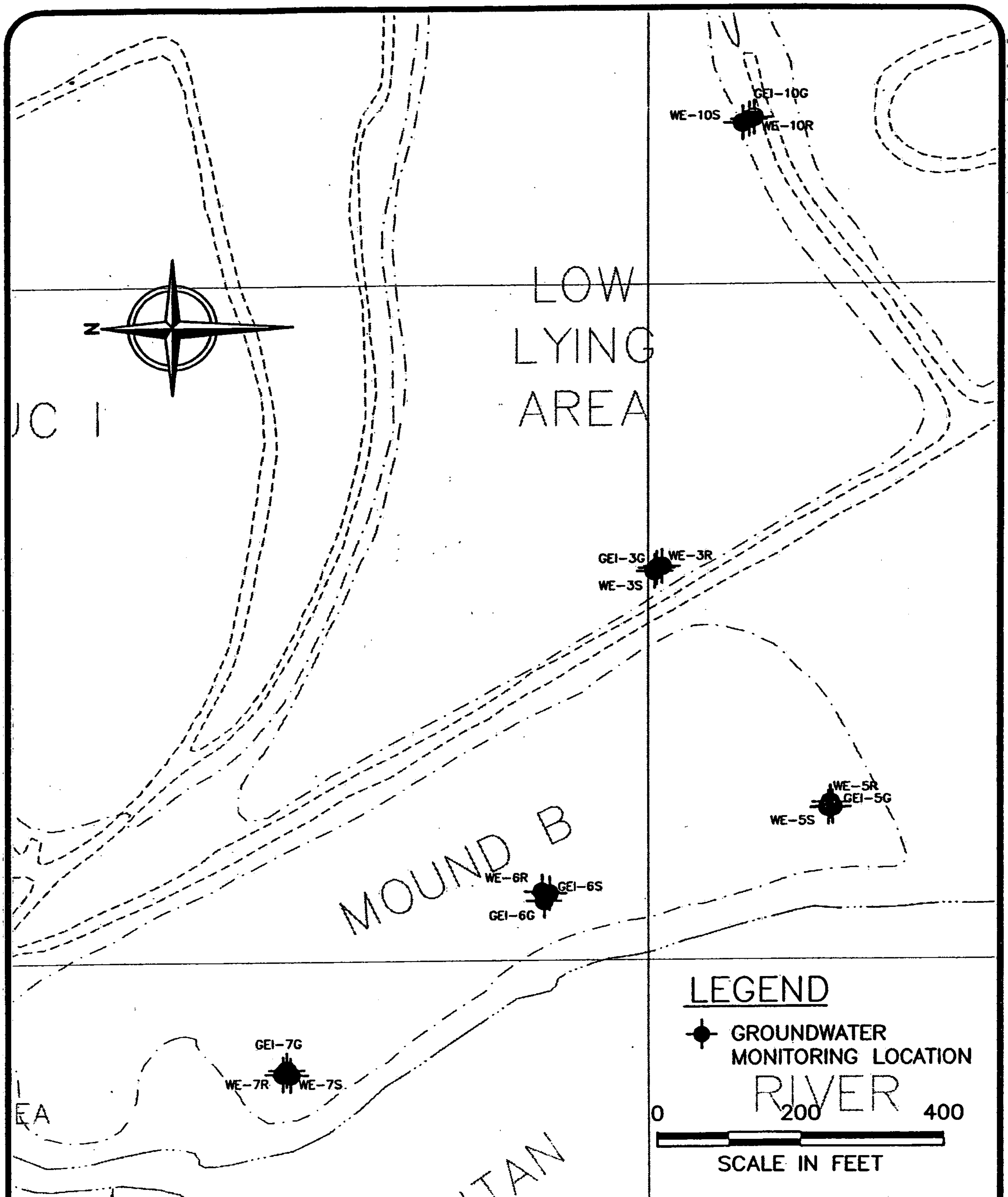
Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.14		10.11		9.93		9.90		na		na
DATE												
12/10/01	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/02	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/02	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/02	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/02	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/02	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/02	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/02	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na

Table 5-1

Kin-Buc Landfill
Operable Unit 1
Second Quarter 2002 Modified Program
Gas Monitoring Well Network/Results

Well (Network) Location	Monitoring Result	
	% LEL	% GAS
GMW-01	0	0
GMW-02	0	0
GMW-03	0	0
GMW-04	0	0
GMW-05	0	0
GMW-06	0	0
Operational Flare Inlet	NA	50.2

Figure



EMCON

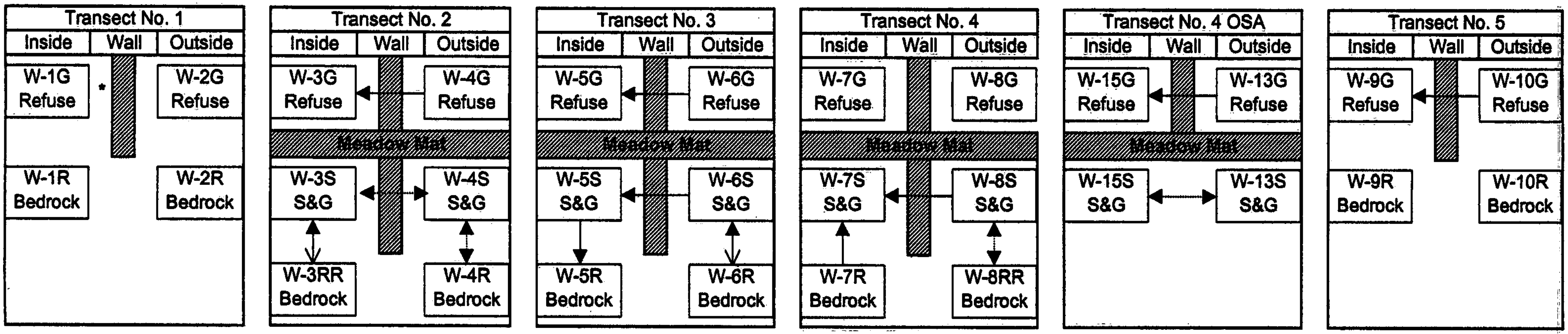
DATE
DWN
APP
REV
PROJECT NO.
12568-001.000

FIGURE 1-1
KINBUC LANDFILL

EDISON TOWNSHIP, NEW JERSEY
OU2 GROUNDWATER
MONITORING LOCATIONS

ENE-MTOWN2/DATA: N:\DWG\12568001\MAKBF-01.dwg Xrefs: MAKBWED01, MAKBTW01, MAKBBD01
Scale: 1 = 1.00 DimScale: 1 = 200.00 Date: 11/11/96 Time: 1:36 PM Operator: FDEGEORG

Figure 3-1
Kin-Buc Landfill
Hydraulic Profile Summary
Second Quarter 2002



Legend

Horizontal Flow Direction

Vertical Flow Direction

Intermittent Flow - solid arrow indicates dominant flow direction

No Dominant Flow Direction

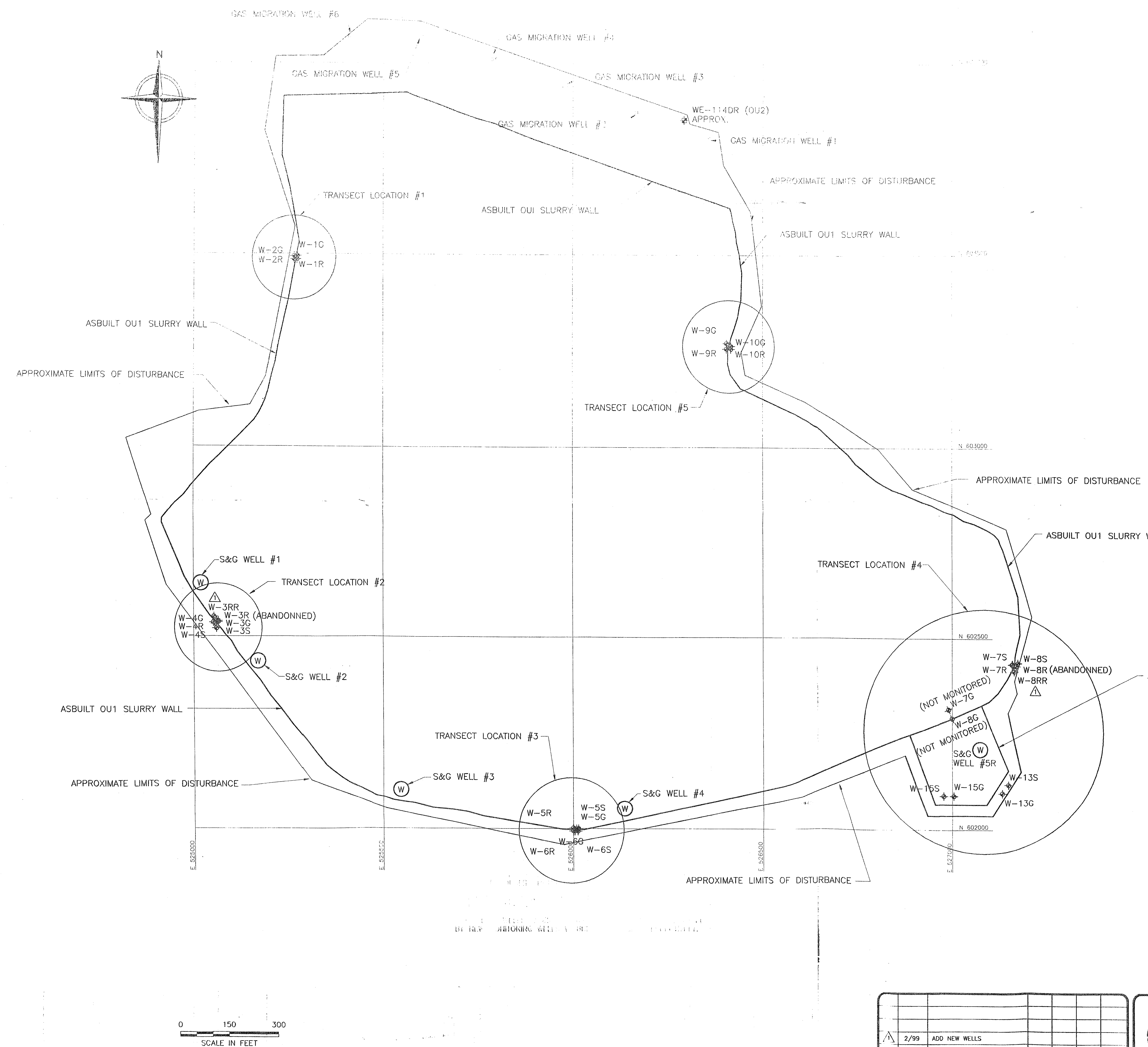
Low Permeability Material

NOTE: * The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in well W-1G do not indicate this condition.

n://proj/kinbuc/quartrptbls/2nd-01/Figure 3-1 hydraulic profile

Drawing

791186



LEGEND

- NEW MONITORING WELLS
- (W) NEW SAND & GRAVEL PUMPING WELLS
- NEW GAS MIGRATION WELLS
- OU2 UPGRADIENT MONITORING BEDROCK WELL (APPROXIMATE LOCATION)

SOURCE: BASEMAP DATA TAKEN FROM PLAN SHEET 10A OF MAP ENTITLED "KINBUC LANDFILL FINAL WELL LOCATION PLAN" PREPARED BY CONTI ENVIRONMENTAL INC. DATED JULY 17, 1995.

NOTES:
1. THE MONITORING WELL LOCATIONS W-7G, W-8G, W-13G, W-13S, W-15G, AND W-15S ARE APPROXIMATE.
2. MONITORING WELL W-8R IS DAMAGED AND NOT SERVICABLE AS A WATER QUALITY MONITORING POINT.
3. MONITORING WELLS W-7G AND W-8G REPLACED BY W-15G AND W-13G.
4. MONITORING WELLS W-8R AND W-3R ABANDONED AND REPLACED BY NEW MONITORING WELLS W-8RR AND W-3RR RESPECTIVELY.

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	2/99	ADD NEW WELLS				

DATE OF ISSUE 5/96 DWN BY SDT DES BY RB CHK BY APP BY

EMCON

KIN-BUC LANDFILL
EXISTING GROUNDWATER MONITORING PLAN
EDISON TOWNSHIP, NEW JERSEY

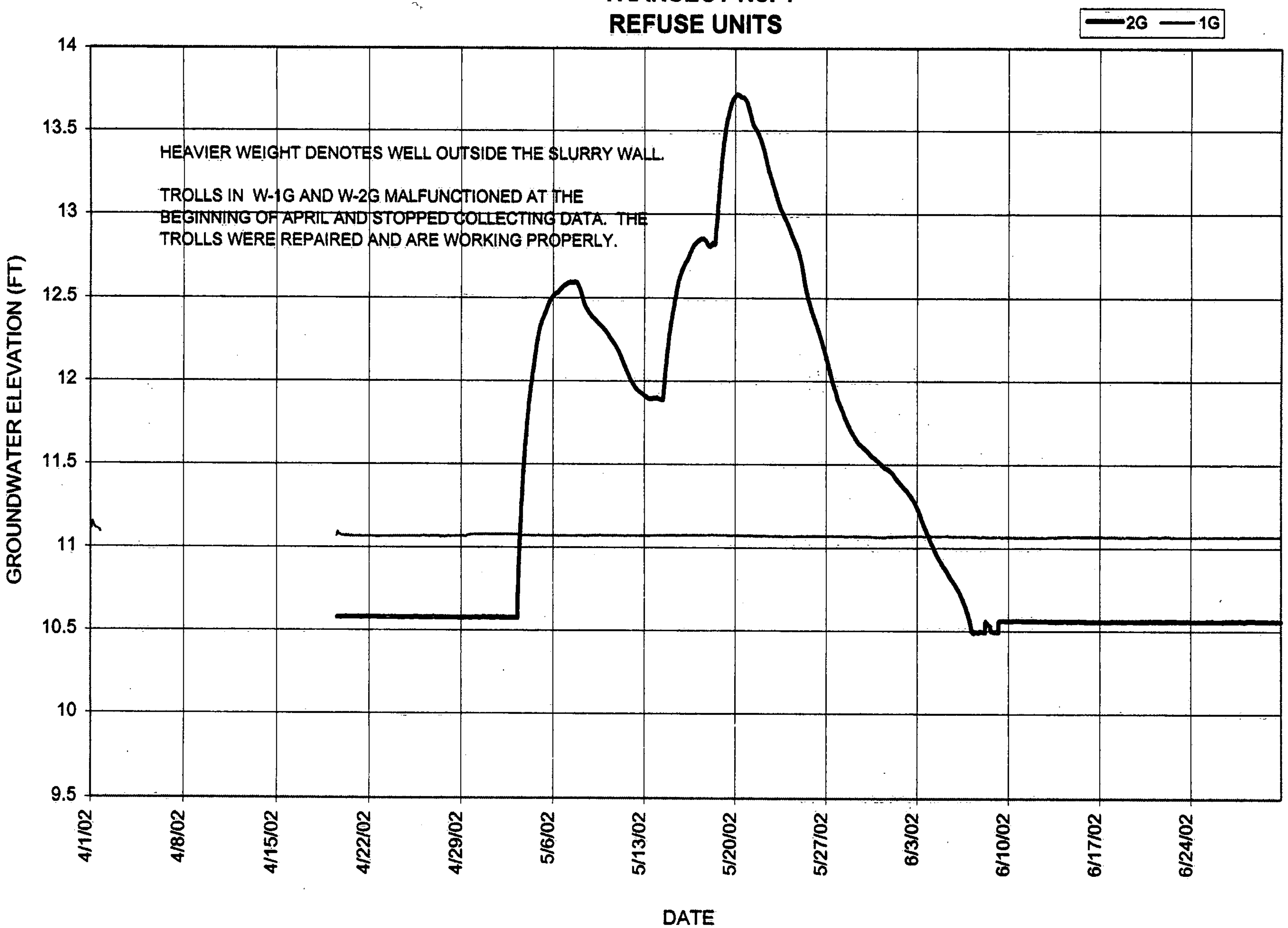
OPERABLE UNIT 1 MONITORING NETWORK

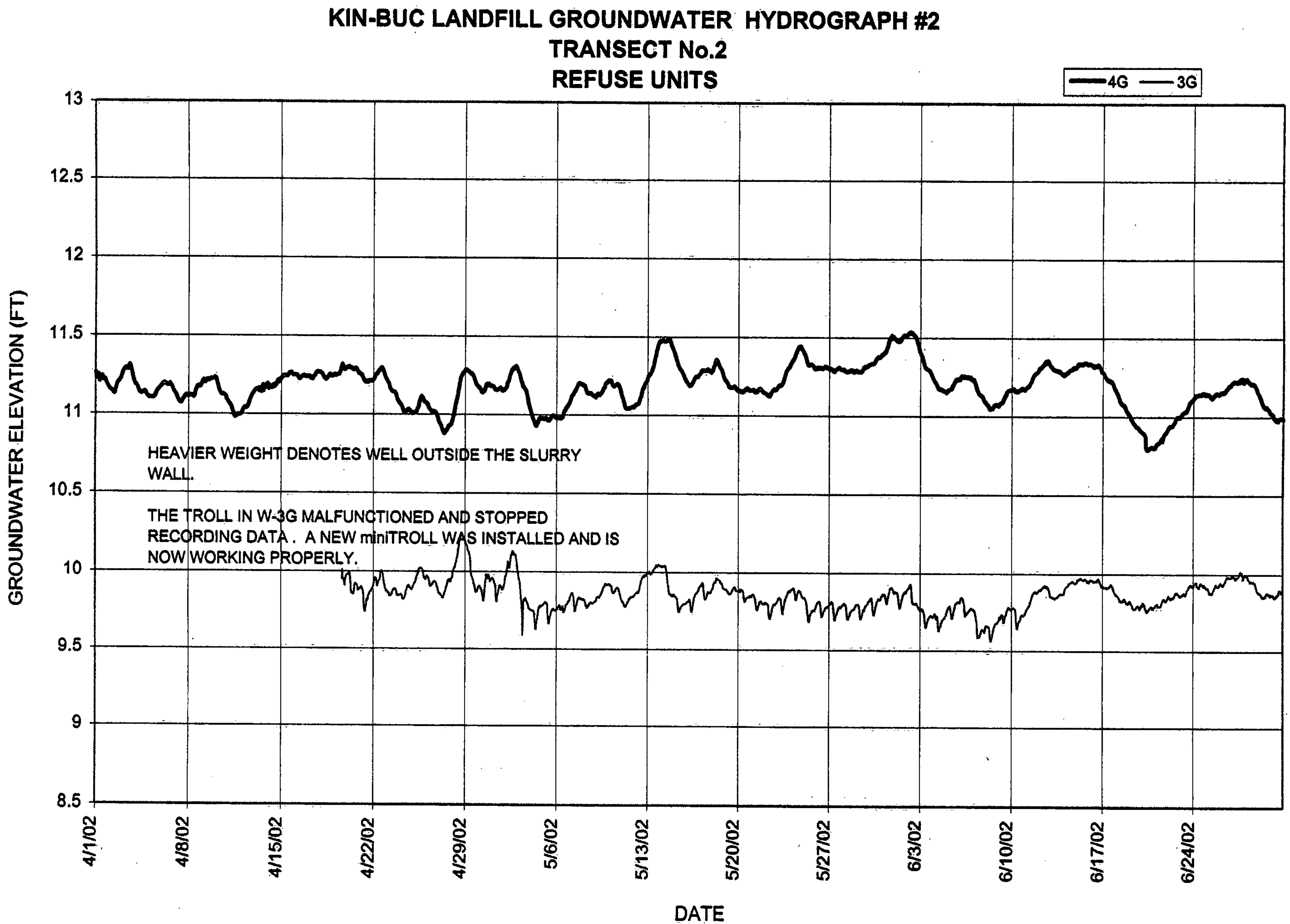
DRAWING NO. 1
PROJECT NO. [illegible]-025.000

APPENDIX A

CONTINUOUS WATER LEVEL MONITORING RESULTS

KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #1
TRANSECT No. 1
REFUSE UNITS





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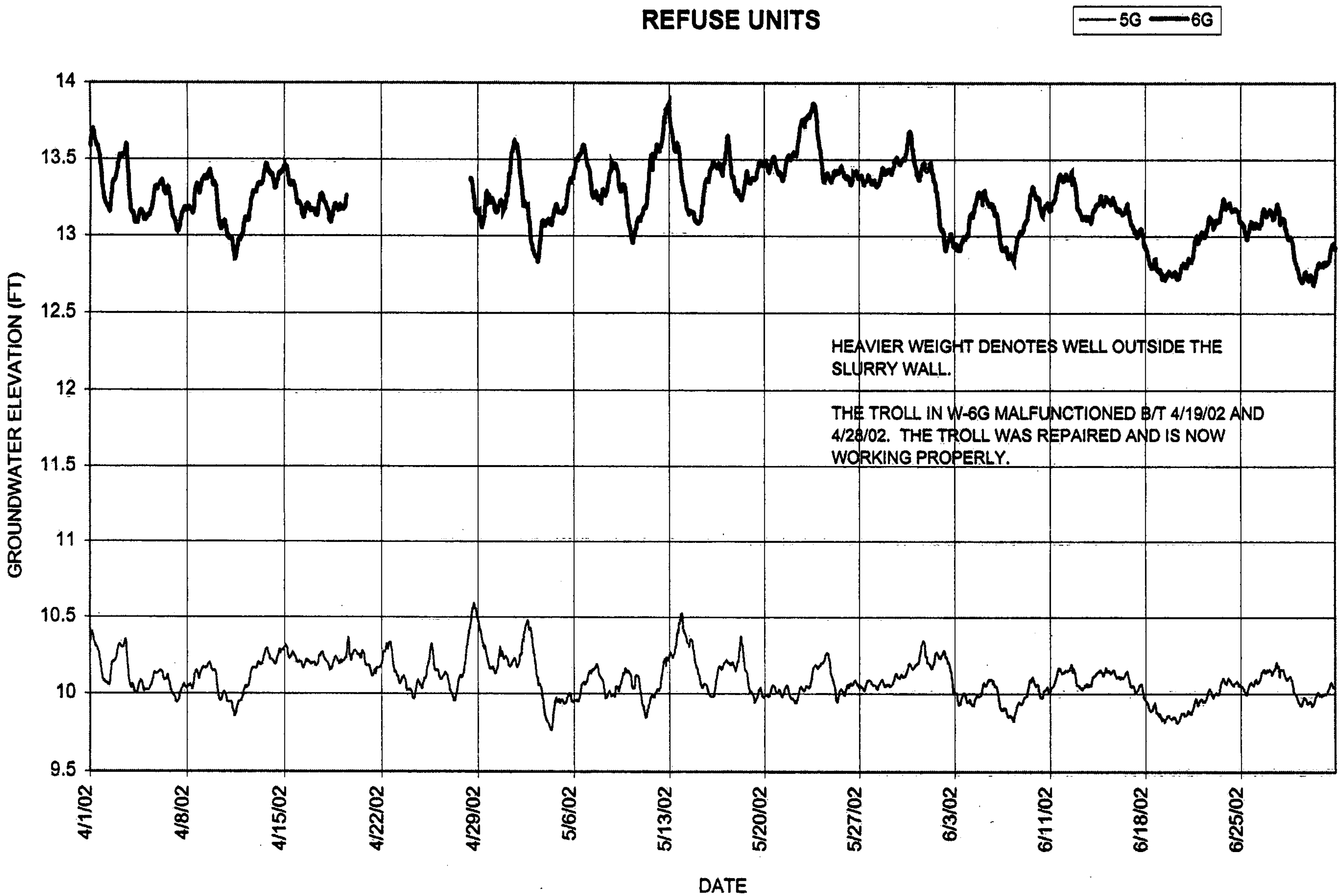
TRANSECT No.3
REFUSE UNITS



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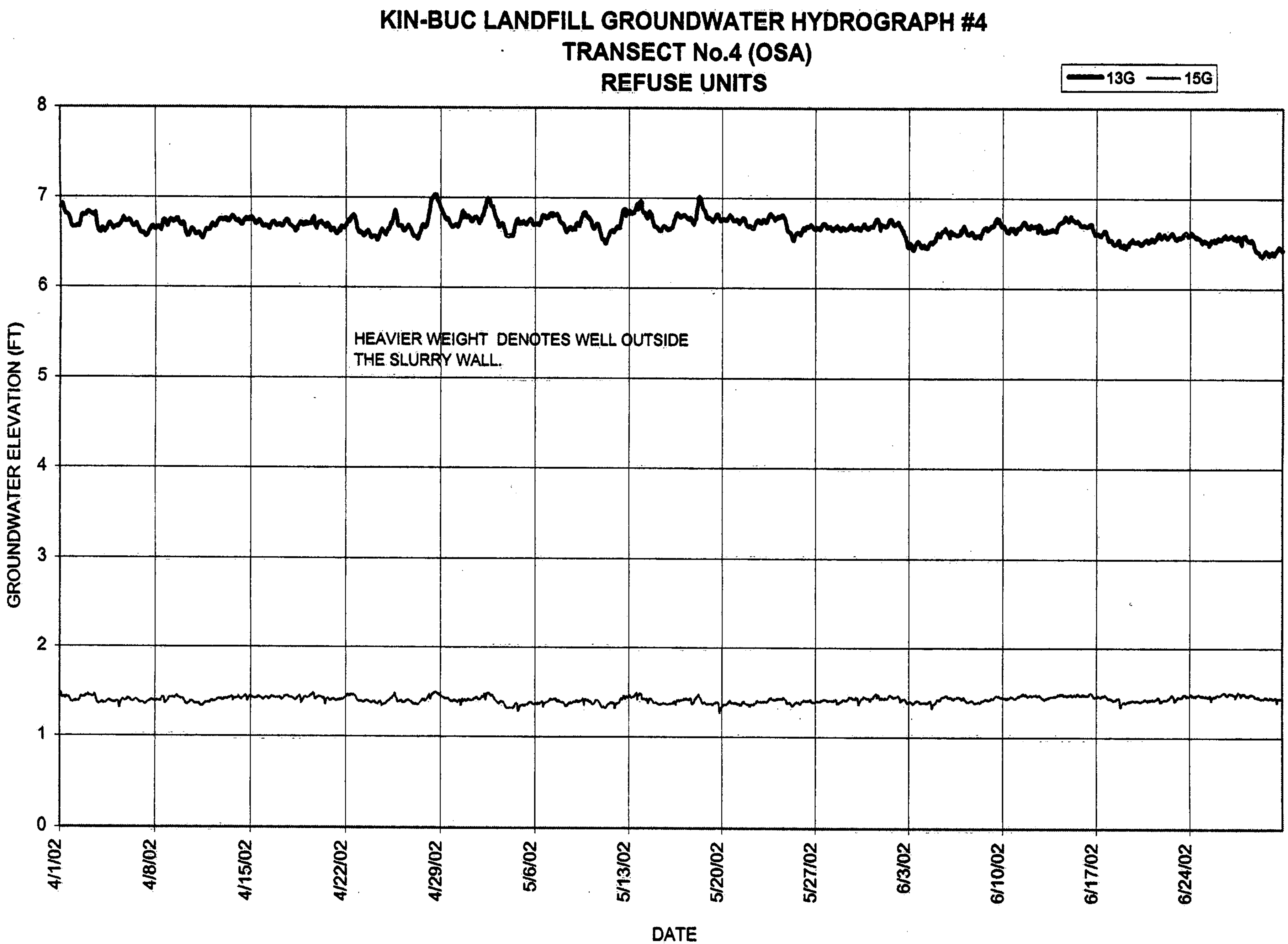

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KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #5
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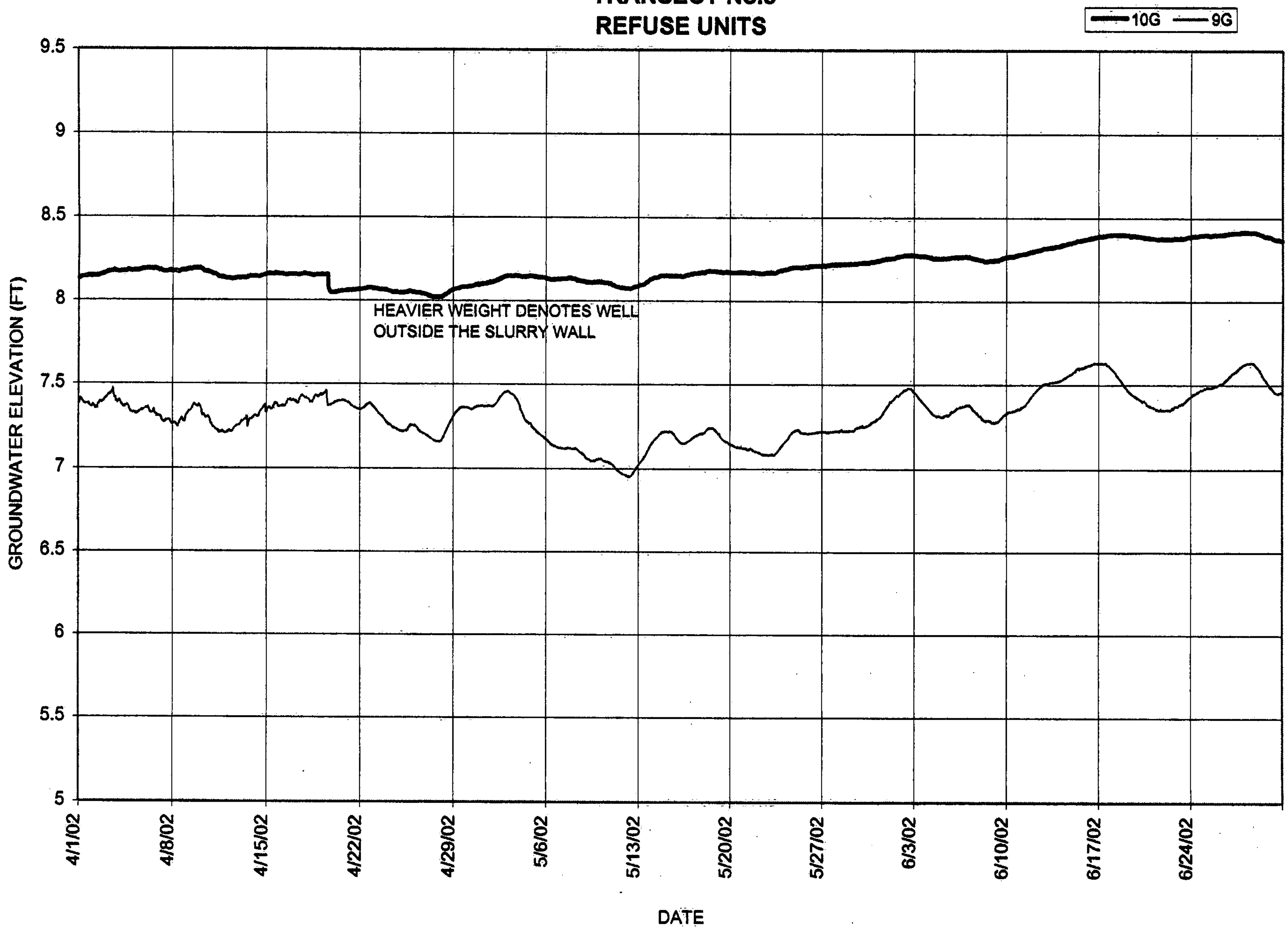

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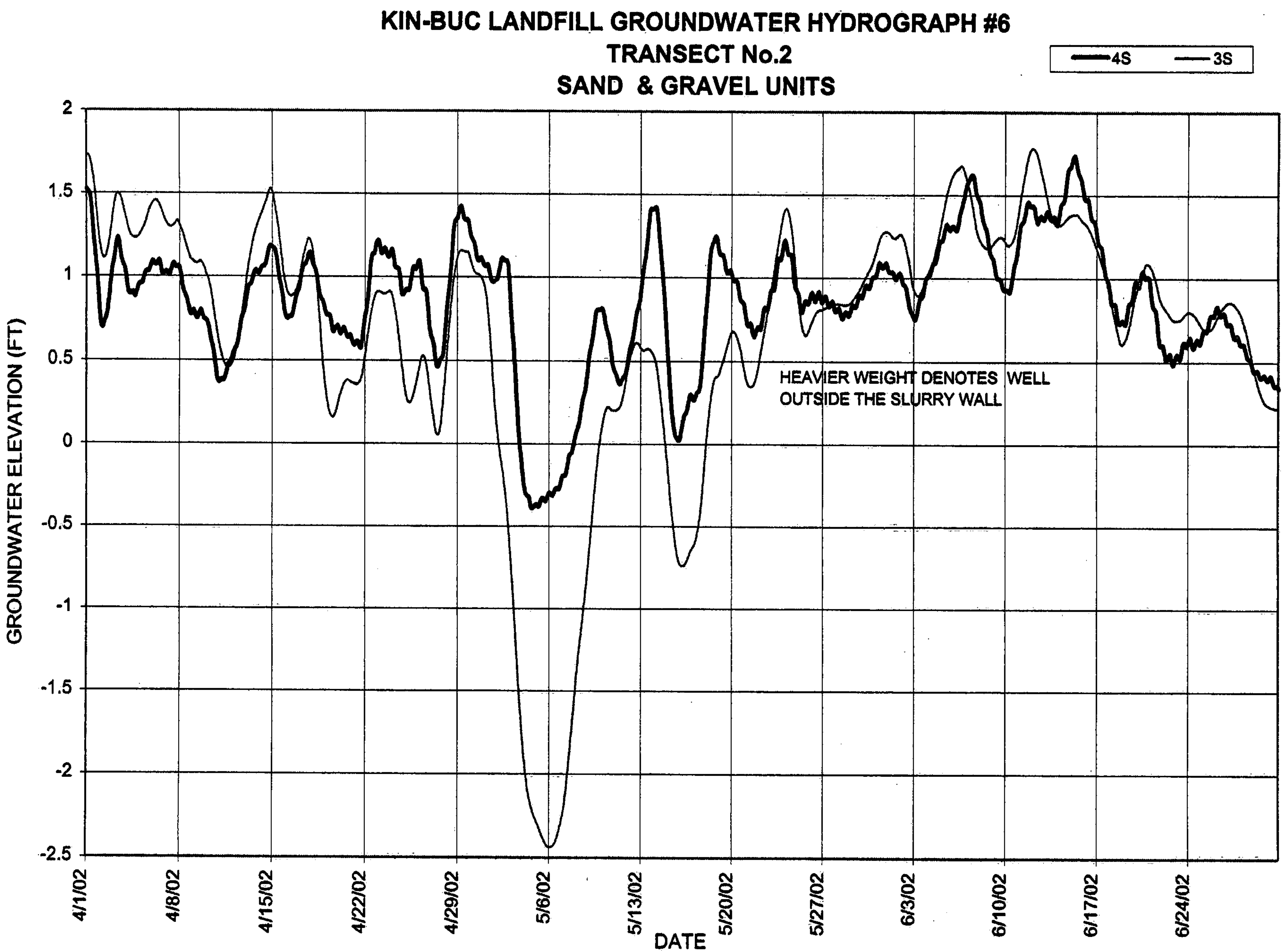

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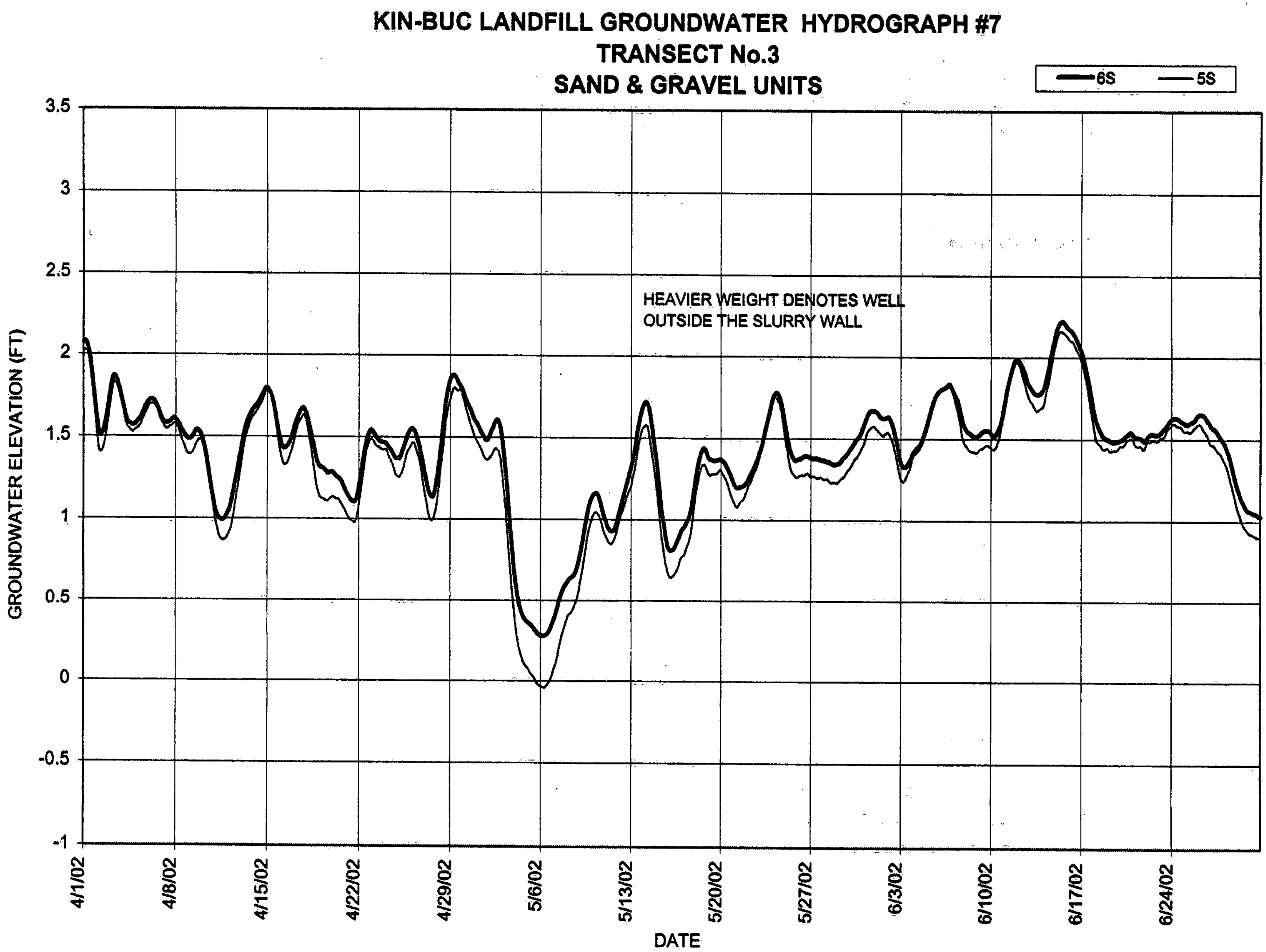

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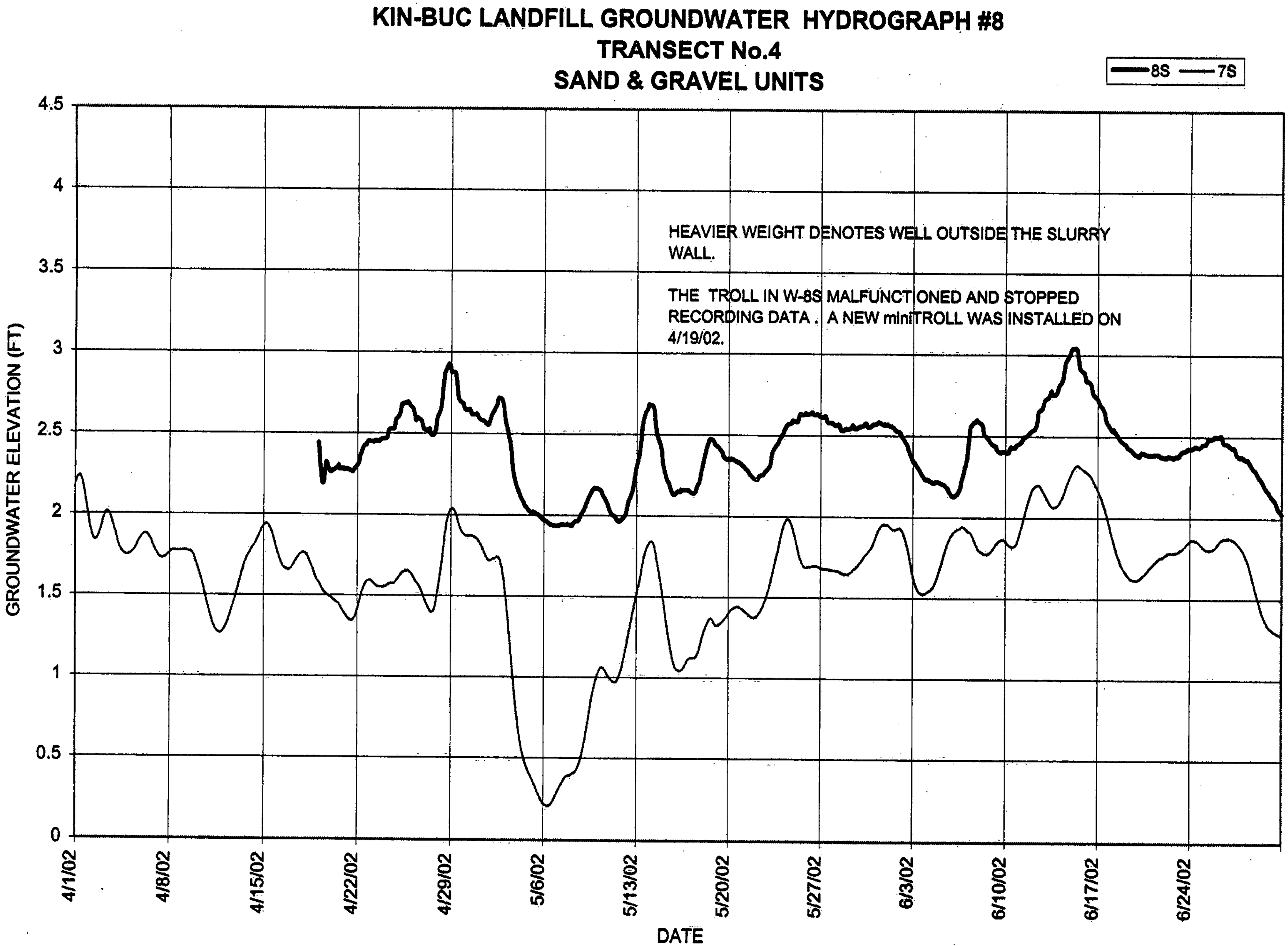

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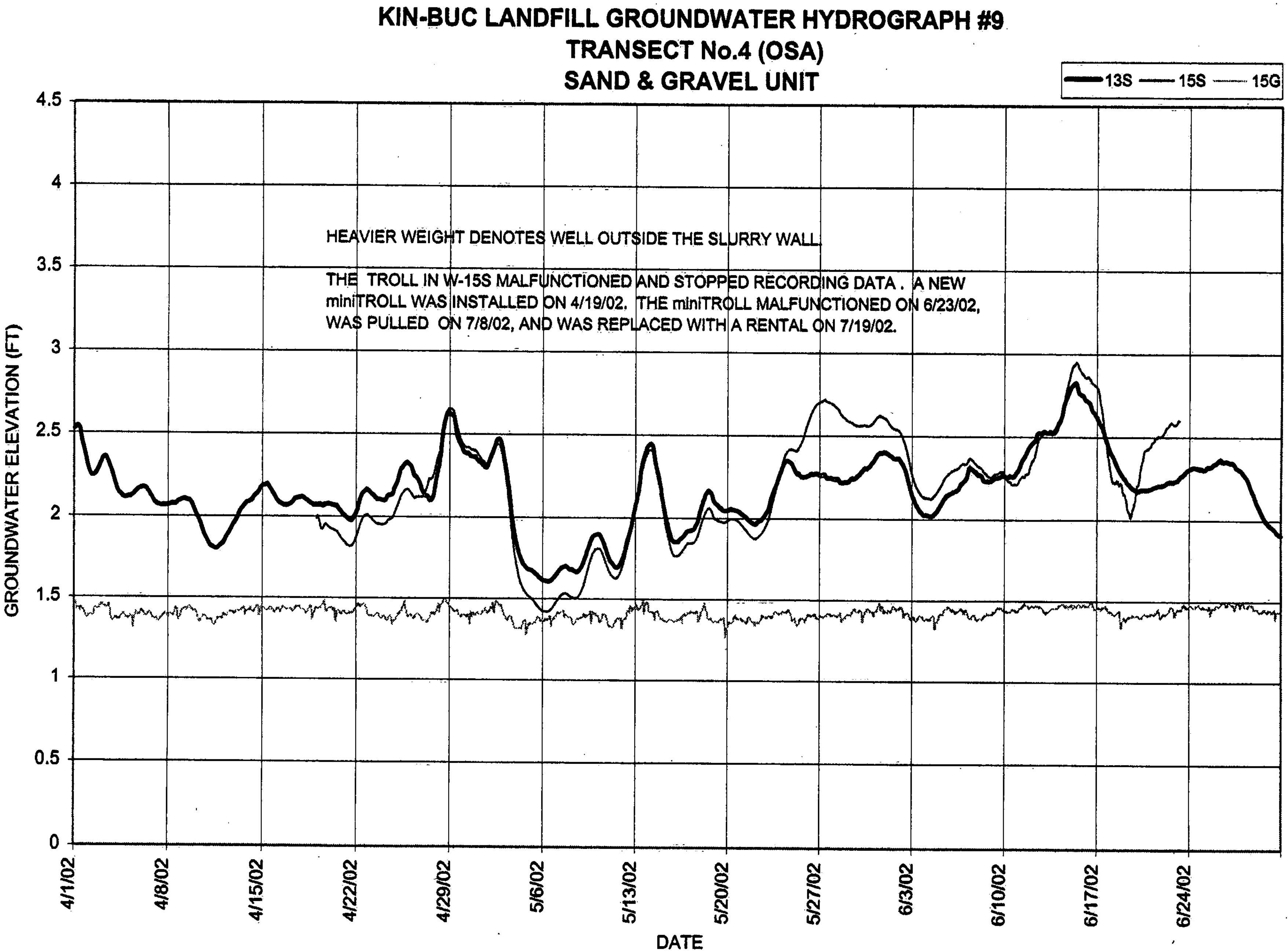

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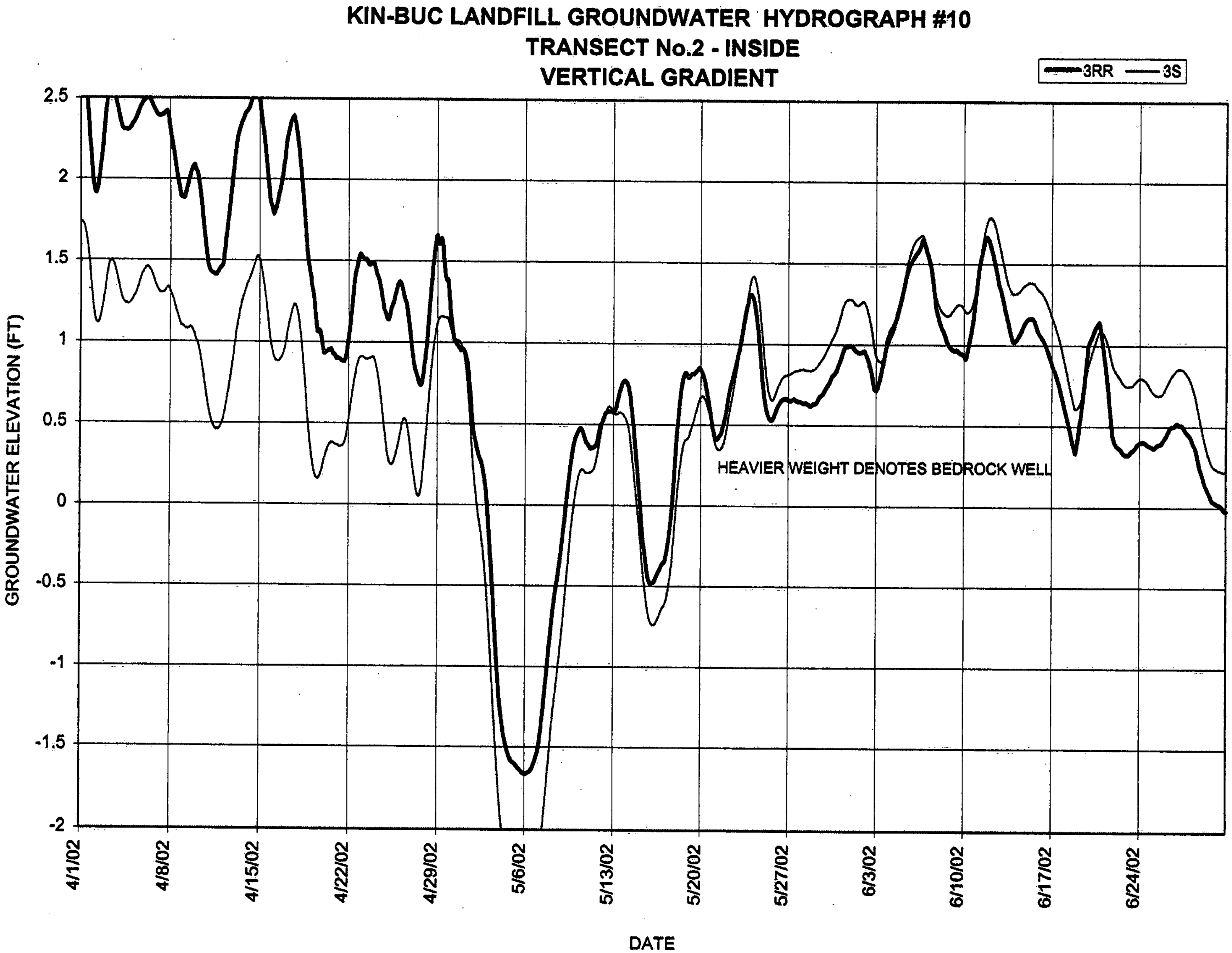

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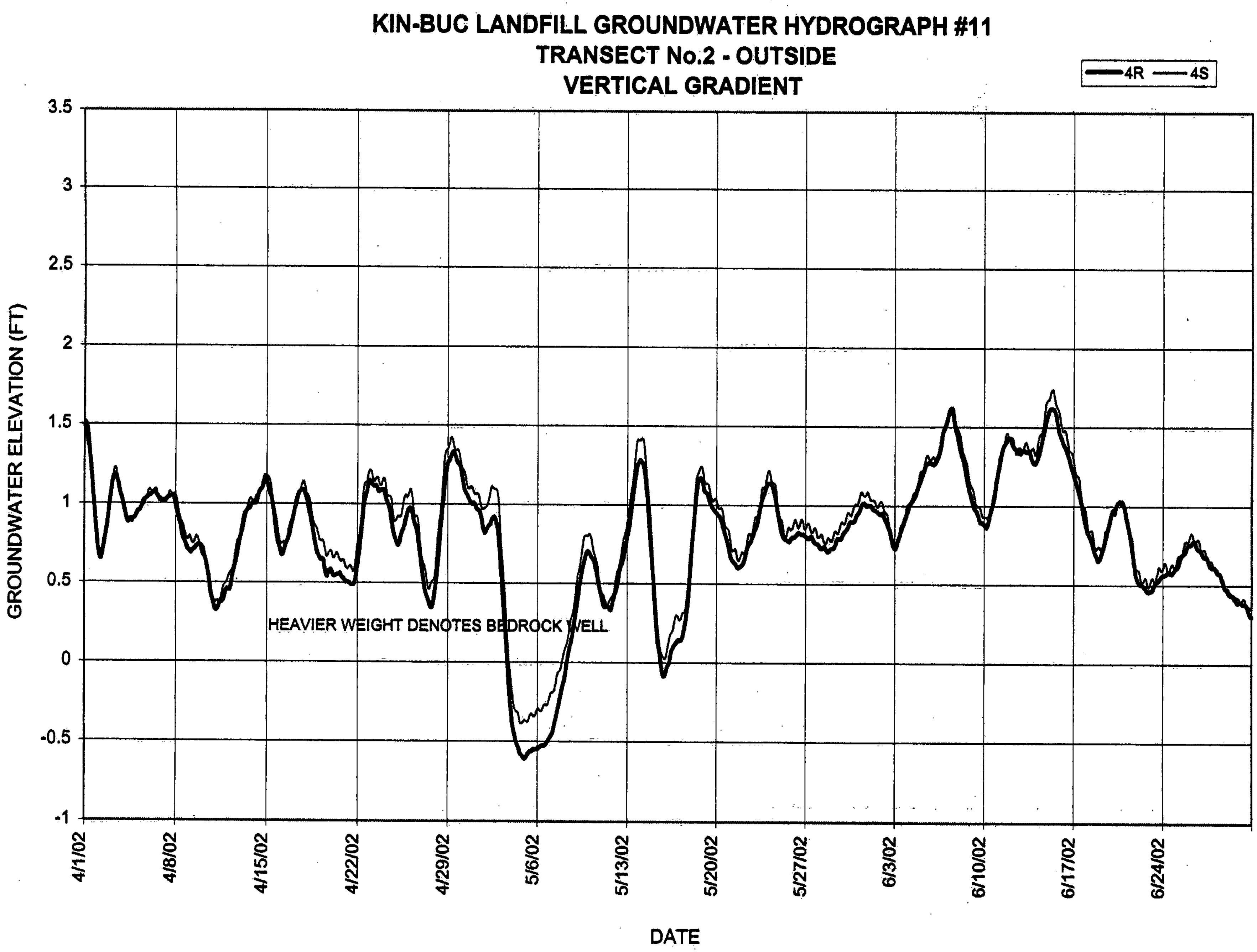

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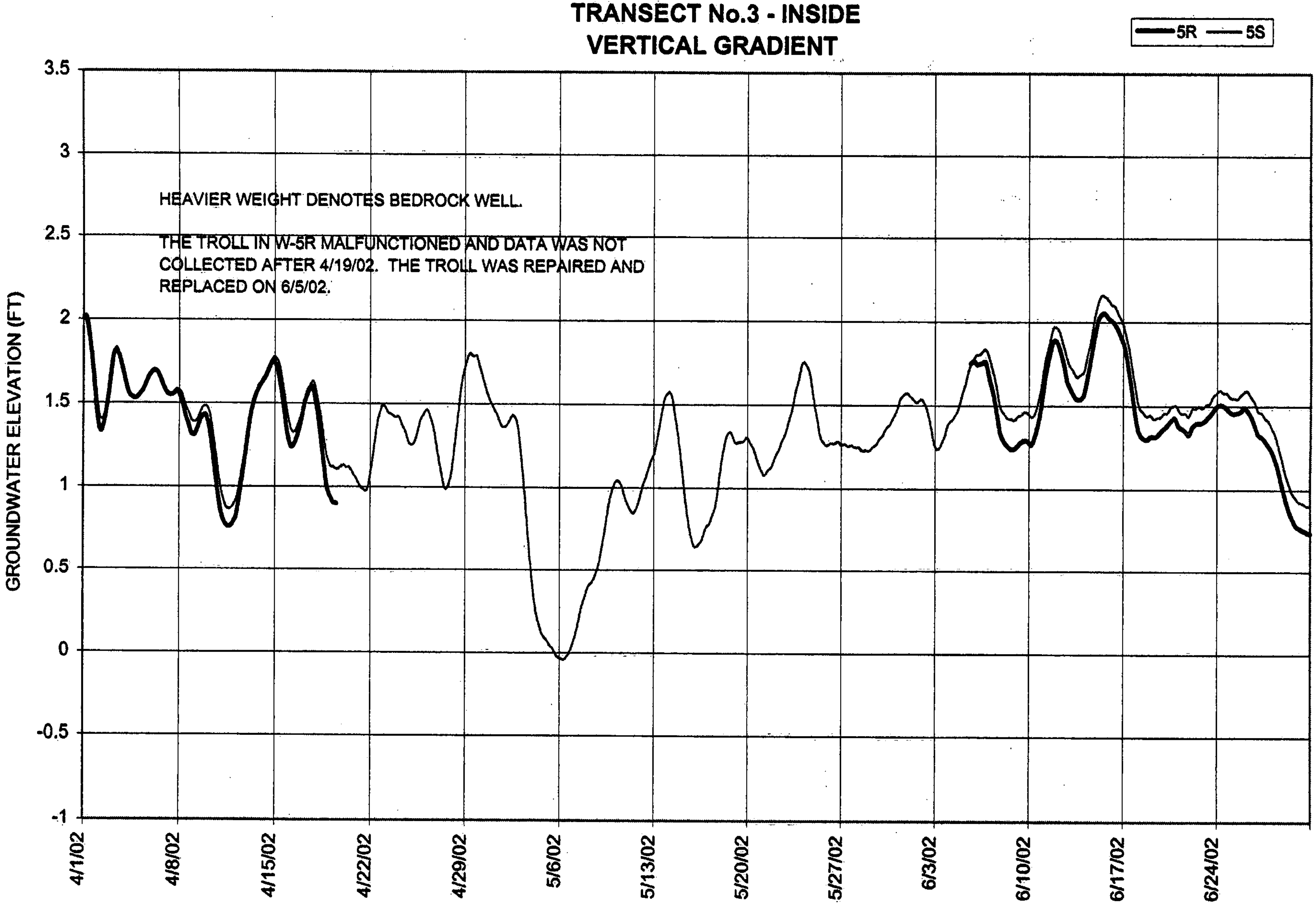
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #12
TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



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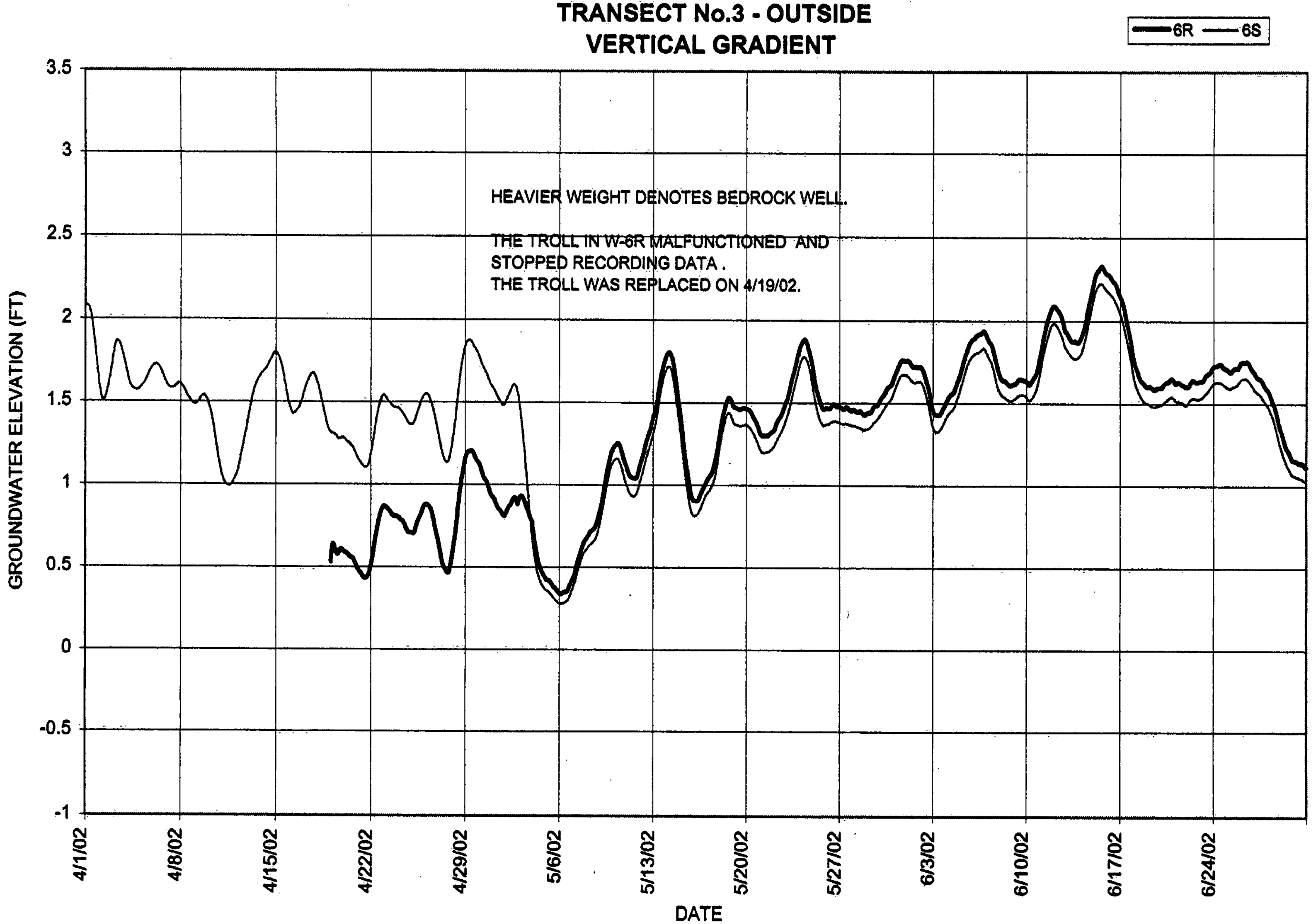
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #13
TRANSECT No.3 - OUTSIDE
VERTICAL GRADIENT



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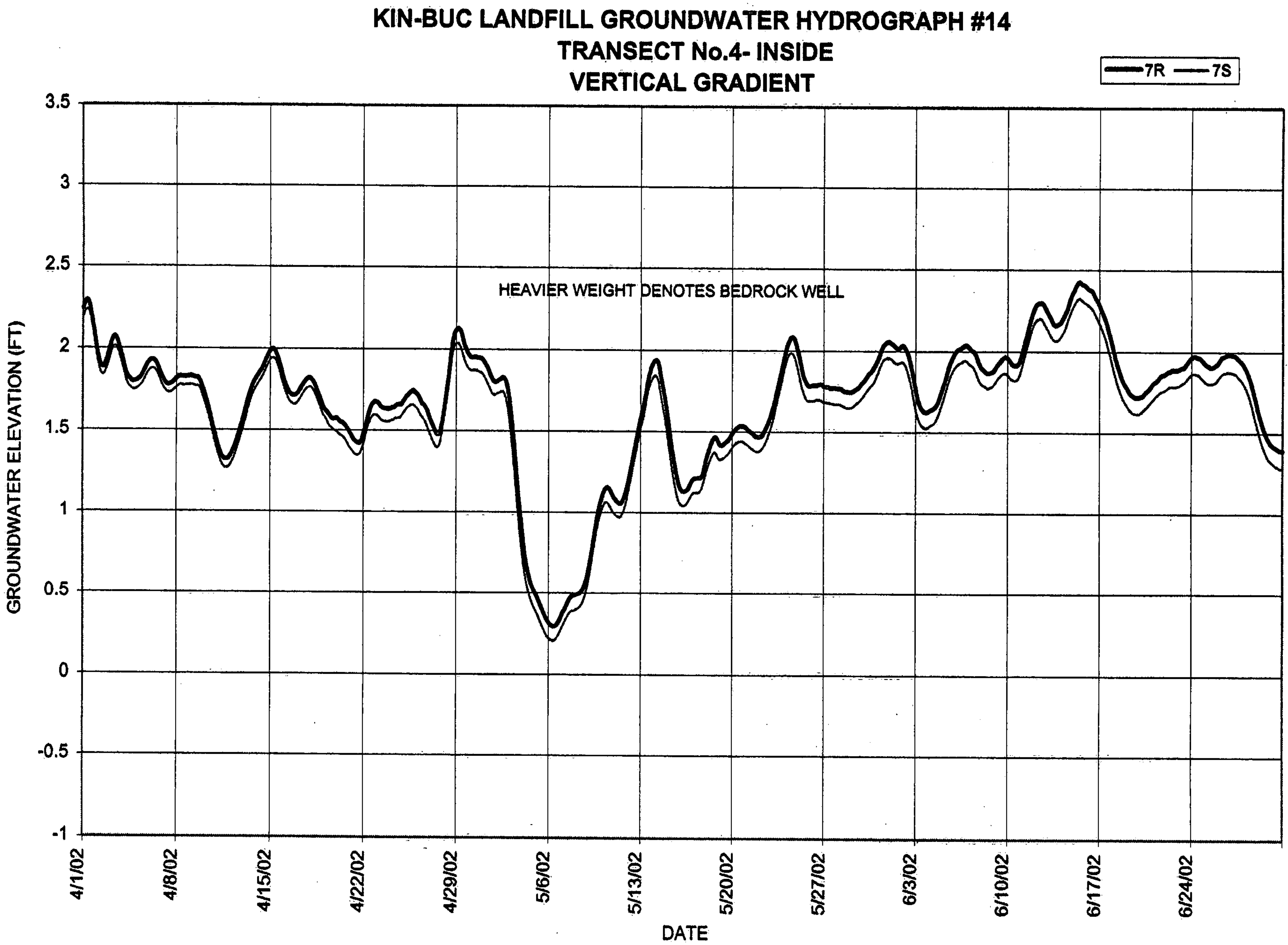

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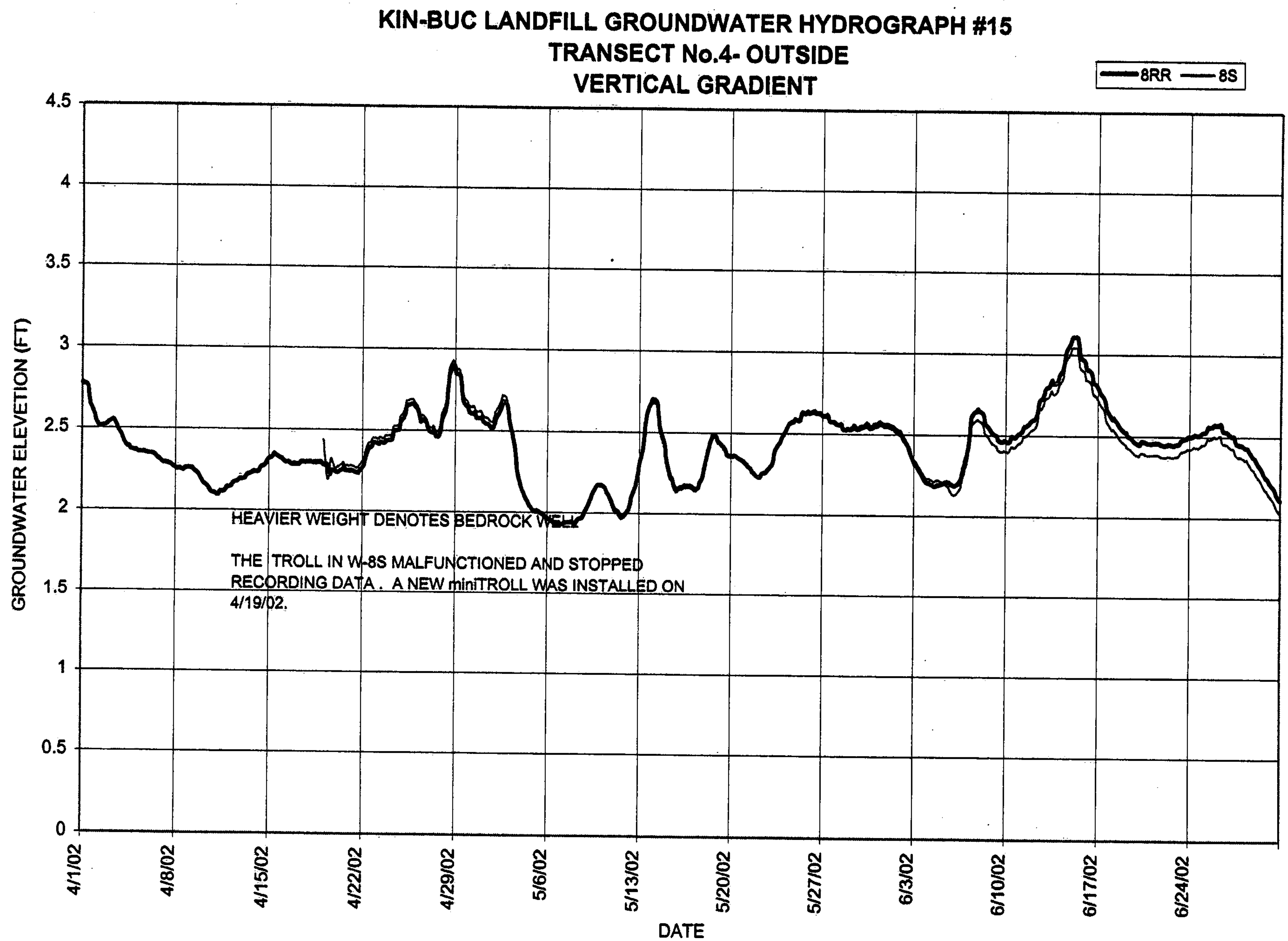


n://proj/kinbuc/15023500.000/1stqt01/Trans4june/8rr-8s

APPENDIX B

MONTHLY HYDRAULIC EVALUATIONS

EMCON/OWT, Inc.
Crossroads Corporate Center
One International Blvd., Suite 700
Mahwah, NJ 07495
Tel: 201-512-5700
Fax: 201-512-5786

EMCON/OWT, Inc.
A Shaw Group Company

June 25, 2002
Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for April 2002

Dear Mr. Januszkiewicz:

A site visit was completed on May 3, 2002 to download water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of April 2002 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by mid August.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. The continuous water level elevation data when compared with manual readings indicated that the Trolls are functioning properly and are recording accurate data. All Troll Data Logger 4000's have been upgraded to new miniTrolls during the site visits of March 27, 2002 and April 19, 2002. Due to complications with the programming of the new data loggers, Trolls in wells W-1G, W-2G, W-3G, W-6G, W-6R, W-8S, and W-15S did not start collecting data until April 19, 2002. Also, the Troll in Well 5R malfunctioned and was sent back to In-Situ for warranty repairs. This Troll was replaced during the site visit on June 5, 2002.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference.

The water levels in wells on the outside of the slurry wall vary significantly over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 show the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Transect 1

Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were not observed during the month. The average monthly water elevation for Well 1G (inside) and Well 2G (outside) was 11.07 and 10.29 feet msl, respectively. The manual water elevations and the hydrograph indicate that Well 2G was dry during the month. Due to complications with the programming of the new data logger in Wells 1G and 2G, data was not collected until April 19, 2002.

Water level elevation measurements taken from Leachate Collection Cleanout Nos. 14 through 16 are included in Table 2, and indicate that the leachate collection system is functioning properly. The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in Wells 1G and 2G do not indicate this condition.

Transect 2

Refuse (3G/4G)/Hydrograph No. 2 – The automatic data recorder for well 3G, inside the wall, malfunctioned and data was not collected until April 19, 2002, when the Troll was replaced with a new miniTroll. The March 27, 2002 manual water elevation readings for Well 3G (inside) and Well 4G (outside) was 10.19 and 11.21 feet msl, respectively. The April 19, 2002 manual water elevation readings for Well 3G (inside) and Well 4G (outside) was 9.83 and 11.29 feet msl, respectively. The manual water elevations for March and April, and the hydrograph indicate intragradient conditions were observed.

Sand and Gravel (3S/4S)/Hydrograph No. 6 - Intragradient conditions were not consistently maintained throughout the month. However, intragradient conditions were observed towards the latter half of the month. The average monthly water elevations for both Well 3S (inside) and Well 4S (outside) was 0.92 feet msl. The difference in the average monthly water elevations was less than 0.2 feet.

Vertical Gradient (3S/3RR)-Inside/Hydrograph No. 10 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall. The average monthly water elevation for Well 3S (sand & gravel) and Well 3RR (bedrock) was 0.92 and 2.03 feet msl, respectively. It should be noted, towards the end of the month the hydrograph is showing a trend toward downward gradient conditions.

Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall. The average monthly water elevation for Wells 4S (sand & gravel) and 4R (bedrock) was 0.92 and 0.86 feet msl, respectively. The difference in average monthly water elevations was less than 0.2 feet.

Transect 3

Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for Well 5G (inside) and Well 6G (outside) was 10.16 and 12.59 feet msl, respectively.

Sand and Gravel (5S/6S)/Hydrograph No. 7 – Slight intragradient conditions were maintained throughout the month. The average monthly water elevation for Well 5S (inside) and Well 6S (outside) was 1.43 and 1.51 feet msl, respectively. The difference in average monthly water elevations was less than 0.2 feet.

Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units inside the slurry wall. A very slight downward gradient was intermittently observed. The automatic data recorder for well 5R, inside the wall, malfunctioned and data was not collected after April 19, 2002. The average monthly water elevation in March for Wells 5S (sand & gravel) and 5R (bedrock) was 1.08 and 0.92 feet msl, respectively. The April 19, 2002 manual water elevation readings for Wells 5S (sand & gravel) and 5R (bedrock) was 0.99 and 0.83 feet msl, respectively. The difference in the water elevations was less than 0.2 feet

Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – The automatic data recorder for well 6R malfunctioned and data was not collected until April 19, 2002, when the Troll was replaced with a new miniTroll. Upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units outside the slurry wall. The March 27, 2002 manual water elevation readings for Well 6S (sand & gravel) and Well 6R (bedrock) were both 1.91 feet msl. The April 19, 2002 manual water elevation readings for Well 6S (sand & gravel) and Well 6R (bedrock) was 1.42 and 0.54 feet msl, respectively. These readings and the hydrograph suggest upward gradient conditions were not observed throughout the month of April.

Transect 4

Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for Well 15G (inside) and Well 13G (outside) was 0.69 and 6.03 feet msl, respectively.

Sand and Gravel (7S/8S)/Hydrograph No. 8 - The automatic data recorder for Well 8S, outside the wall, malfunctioned and data was not collected until April 19, 2002, when the Troll was replaced with a new miniTroll. The March 27, 2002 manual water elevation readings for Well 7S (inside) and Well 8S (outside) was

1.96 and 2.32 feet msl, respectively. The April 19, 2002 manual water elevation readings for Well 7S (inside) and Well 8S (outside) was 1.69 and 2.53 feet msl, respectively. These readings and the hydrograph indicate intragradient conditions were maintained throughout the month.

Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 - Due to an upward gradient between the sand & gravel and refuse units in the oil seeps area, groundwater was not collected from the sand & gravel unit. Water levels from Well W-15G in the refuse unit are included on the hydrograph for comparison. The automatic data recorder for Well 15S, outside the wall, malfunctioned and data was not collected until April 19, 2002, when the Troll was replaced with a new miniTroll. The average monthly water elevation in March for Well 15S (inside) and Well 13S (outside) was 1.93 and 2.16 feet msl, respectively. The April 19, 2002 manual water elevation readings for Well 15S (inside) and Well 13S (outside) was 2.06 and 2.15 feet msl, respectively.

Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month. The average monthly water elevation for Well 7S (sand & gravel) and Well 7R (bedrock) was 2.37 and 2.53 feet msl, respectively. The difference in average monthly water elevations was less than 0.2 feet.

Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 - The automatic data recorder for well 8S malfunctioned and data was not collected until April 19, 2002, when the Troll was replaced with a new miniTroll. The March 27, 2002 manual water elevation readings for Well 8S (sand & gravel) and Well 8RR (bedrock) was 2.32 and 2.49 feet msl, respectively. The April 19, 2002 manual water elevation readings for Well 8S (sand & gravel) and Well 8RR (bedrock) was 2.35 and 2.22 feet msl, respectively. These readings and the hydrograph suggest upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units outside the slurry wall.

Transect 5

Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for Well 9G (inside) and Well 10G (outside) was 7.33 and 8.13 feet msl, respectively.

Figure 1 shows the hydraulic profile summary for April 2002.

Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from April 1 to April 30, 2002:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
48,756 gal.	222,538 gal.	125,369 gal.	7,672 gal.	36,694 gal.
1,625 gpd	7,418 gpd	4,179 gpd	256 gpd	1,223 gpd

For the period, a total of 404,335 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 13,478 gpd. The extraction rate from S&G No. 2 was 7,418 gpd, and the extraction rate from S&G No. 3 was 4,179 gpd. The leachate extraction rate of 1,223 gpd was below the recommended rate of 1,500 gpd.

CONCLUSIONS

- Intragradient conditions were maintained in the refuse unit at Transects 2, 3, 4, and 5.

- Intragradient conditions were not indicated by the monitoring wells in the refuse unit at Transect 1, although levels in the leachate collection system indicate intragradient conditions are present at this location.

- Intragradient conditions were maintained in the sand & gravel unit at Transects 3 and 4. Intragradient conditions were not consistently observed in the sand & gravel unit at Transect 2.

- Inside the slurry wall, upward gradient conditions were not observed between the bedrock and overlying sand & gravel unit at Transect 3. A slight upward gradient condition was observed at Transect 4. However, at Transect 2 upward gradient conditions were observed between the bedrock and overlying sand & gravel unit until the end of the month.

- Outside the slurry wall, upward gradient conditions were observed between the bedrock and overlying sand & gravel unit at Transects 2 and 4. However, upward gradient conditions were not consistently observed at Transect 3 based on manual water elevations obtained in January, February, March, and April.

RECOMMENDATIONS

- The leachate collection rate should be maintained at approximately 1,500 gpd.

- Pursuant to our letter of June 18, 2002 (see attached), pumping rates of S&G-2 and S&G-3 will be consistently maintained at approximately 15 gpm and 6 gpm, respectively, to determine if hydraulic control can be maintained. Following the next scheduled site visit (July 5, 2002) the groundwater elevation data will be evaluated to determine the effectiveness of the new pumping regime on achieving consistent hydraulic control.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

Sincerely,

EMCON/OWT, INC.

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Adam J. Licardi
Environmental Scientist

Attachments

cc: Glenn Grieb, US Filter

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2002 Minimum/Maximum Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-1G	April	11.07	11.16	11.07	W-2G	April	10.29	10.30	10.29
W-3G	April	9.74	10.24	9.93	W-4G	April	10.88	11.32	11.16
W-3S	April	-0.13	1.96	0.92	W-4S	April	-0.41	2.44	0.92
W-5G	April	9.85	10.59	10.16	W-6G	April	12.11	13.31	12.59
W-5S	April	0.78	2.27	1.43	W-6S	April	0.86	2.34	1.51
W-7S	April	1.21	2.37	1.69	W-8S	April	2.01	4.45	2.53
W-15S	April	1.71	3.15	2.14	W-13S	April	1.63	3.48	2.15
W-15G	April	0.59	0.77	0.69	W-13G	April	5.85	6.36	6.03
W-9G	April	7.16	7.48	7.33	W-10G	April	8.02	8.21	8.13

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2002 Minimum/Maximum Water Elevations

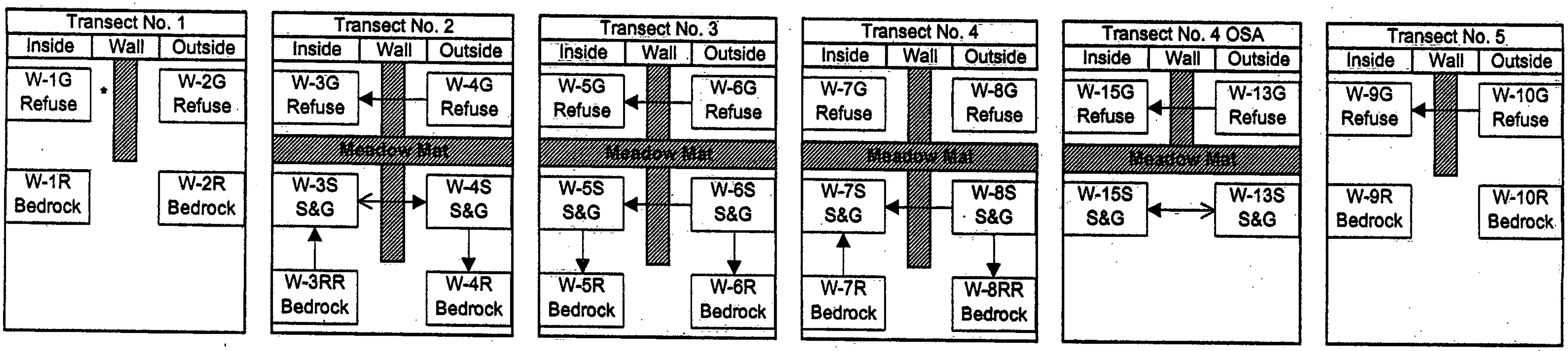
Inside Slurry Wall					Outside Slurry Wall				
Well ID	**Monitoring Month**	**Minimum Recorded Water Elevation**	**Maximum Recorded Water Elevation**	**Average Water Elevation**	**Well ID**	**Monitoring Month**	**Minimum Recorded Water Elevation**	**Maximum Recorded Water Elevation**	**Average Water Elevation**
W-3RR	April	0.48	3.56	2.03	W-4R	April	-0.70	2.50	0.86
W-5R	April	0.65	2.26	1.43	W-6R	April	0.28	1.43	0.77
W-7R	April	1.27	2.41	1.76	W-8RR	April	1.84	4.41	2.38

Note: 1. Troll malfunctioned, data was not collected
2. Water elevation calculated from manual water levels.

Table 2
Kin-Buc Landfill
Leachate Cleanout Monitoring
2002

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
[redacted]	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.21		10.18		9.97		9.98		na		na
DATE												
12/10/01	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/02	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/02	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/02	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/02	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na

Figure 1
Kin-Buc Landfill
Hydraulic Profile Summary
April 2002



Legend

Horizontal Flow Direction

Vertical Flow Direction

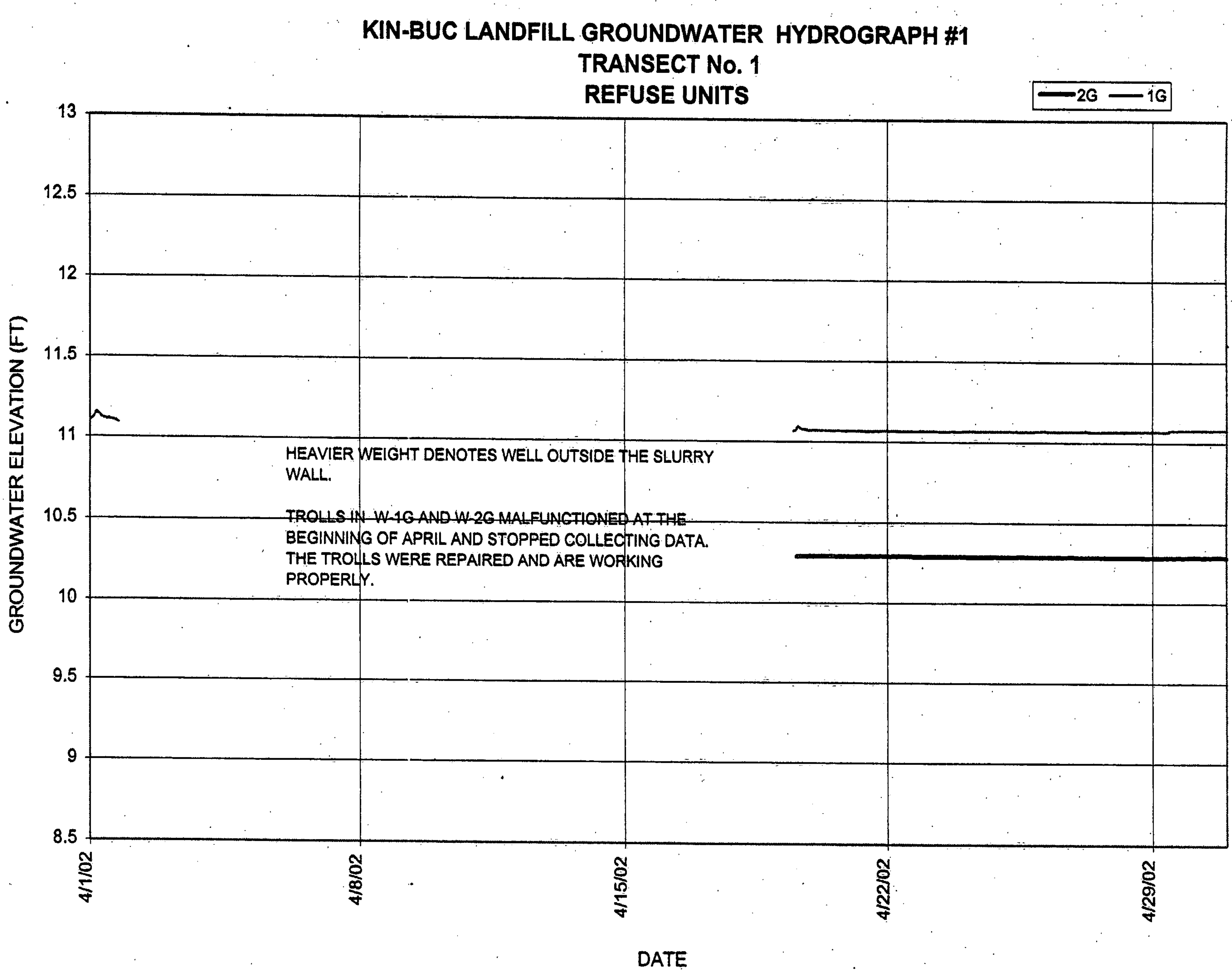
Intermittent Flow - solid arrow indicates dominate flow direction

No Dominant Flow Direction

Low Permeability Material

NOTE: * The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in well W-1G do not indicate this condition.

n://proj/kinbuc/quartrptbls/2nd-01/Figure1 hydrolic profile2002



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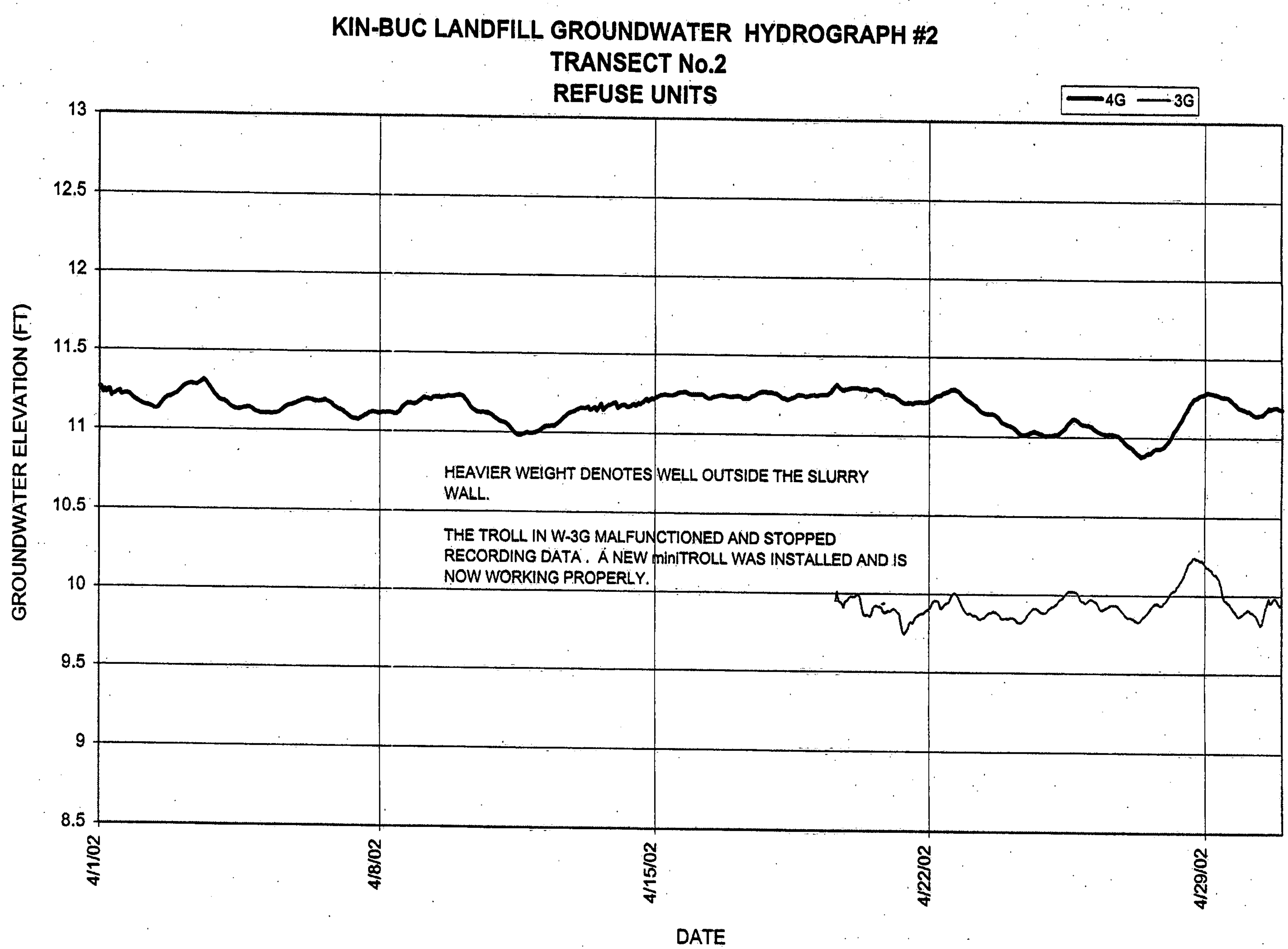

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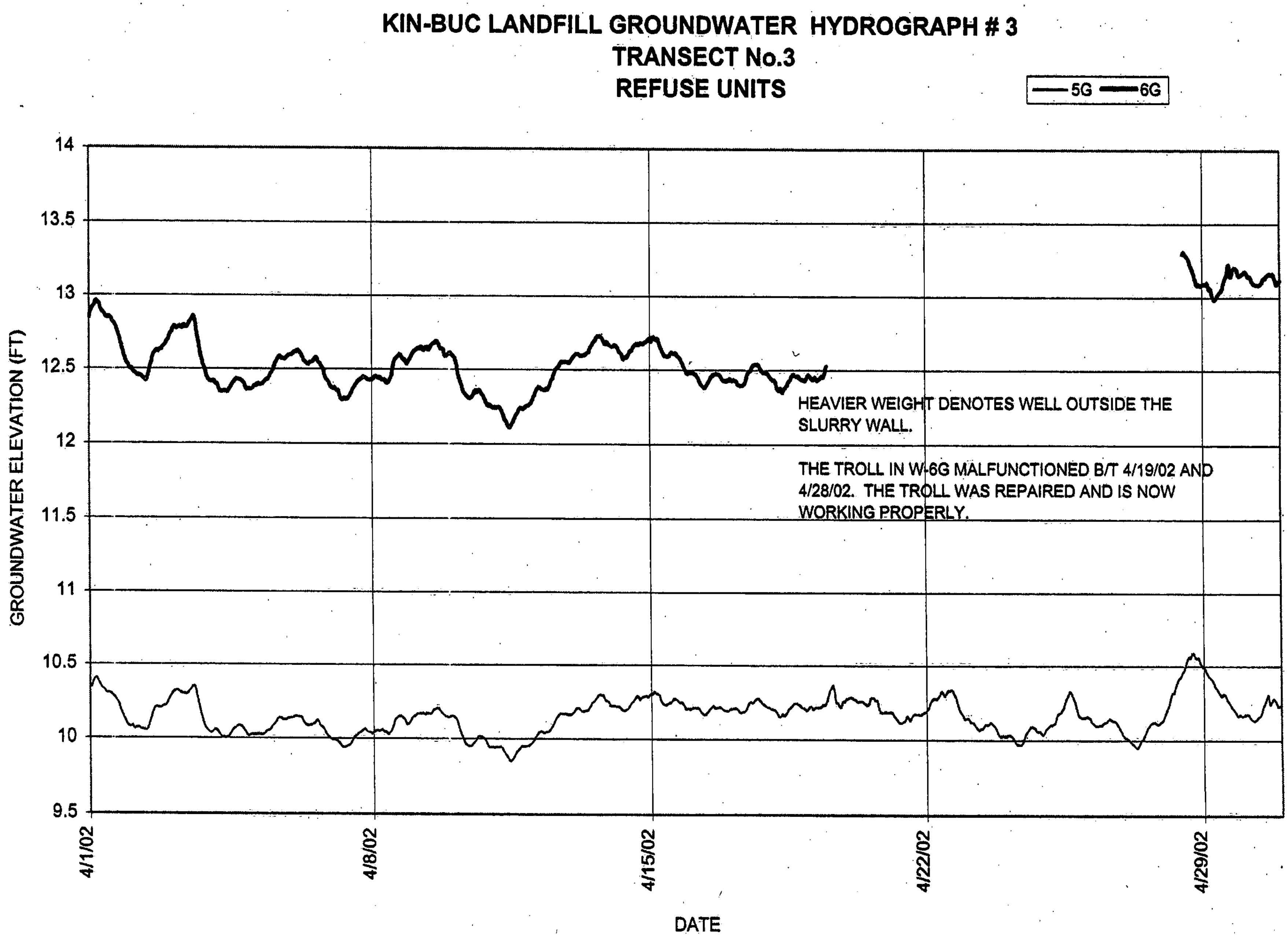

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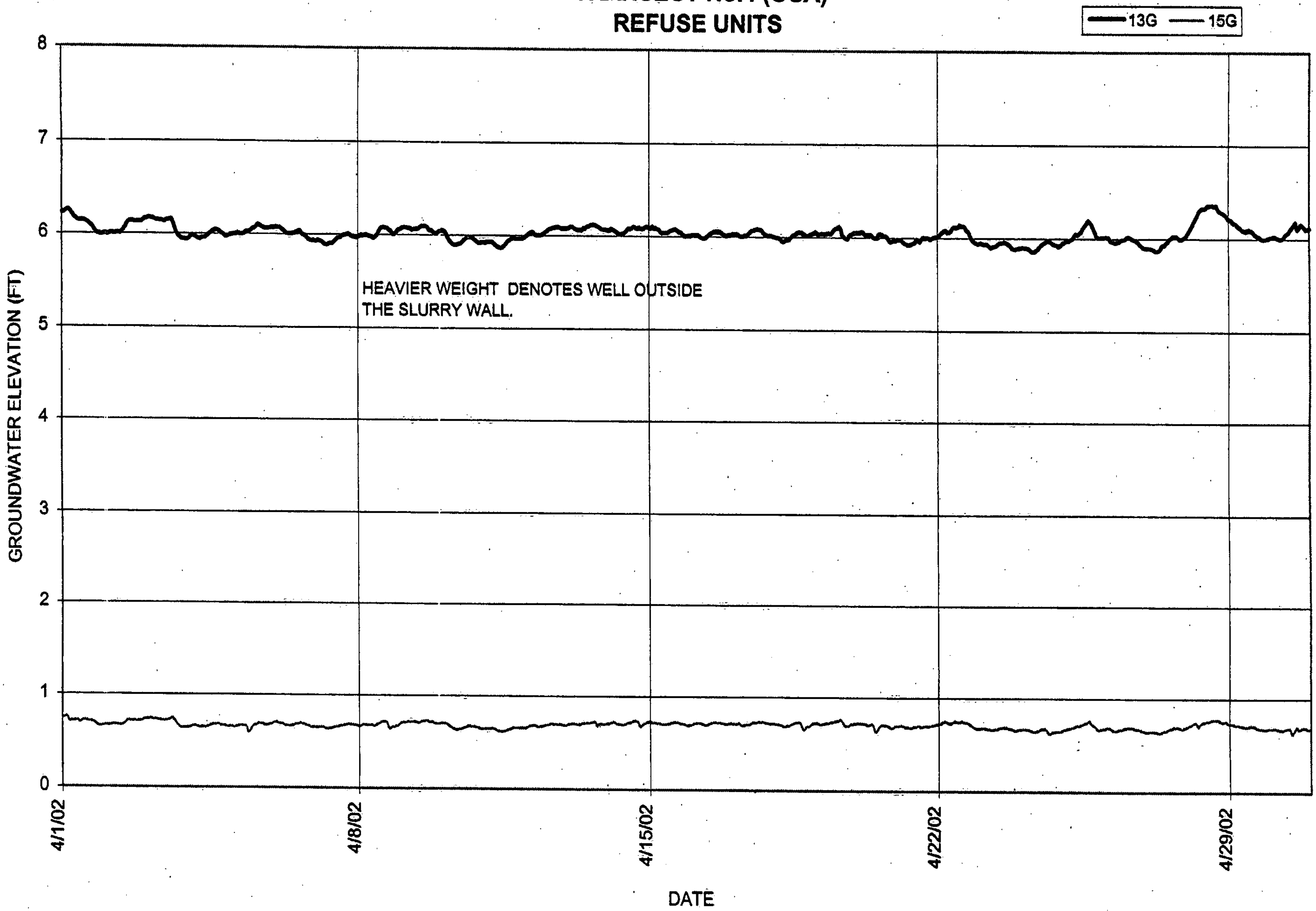
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #4
TRANSECT No.4 (OSA)
REFUSE UNITS



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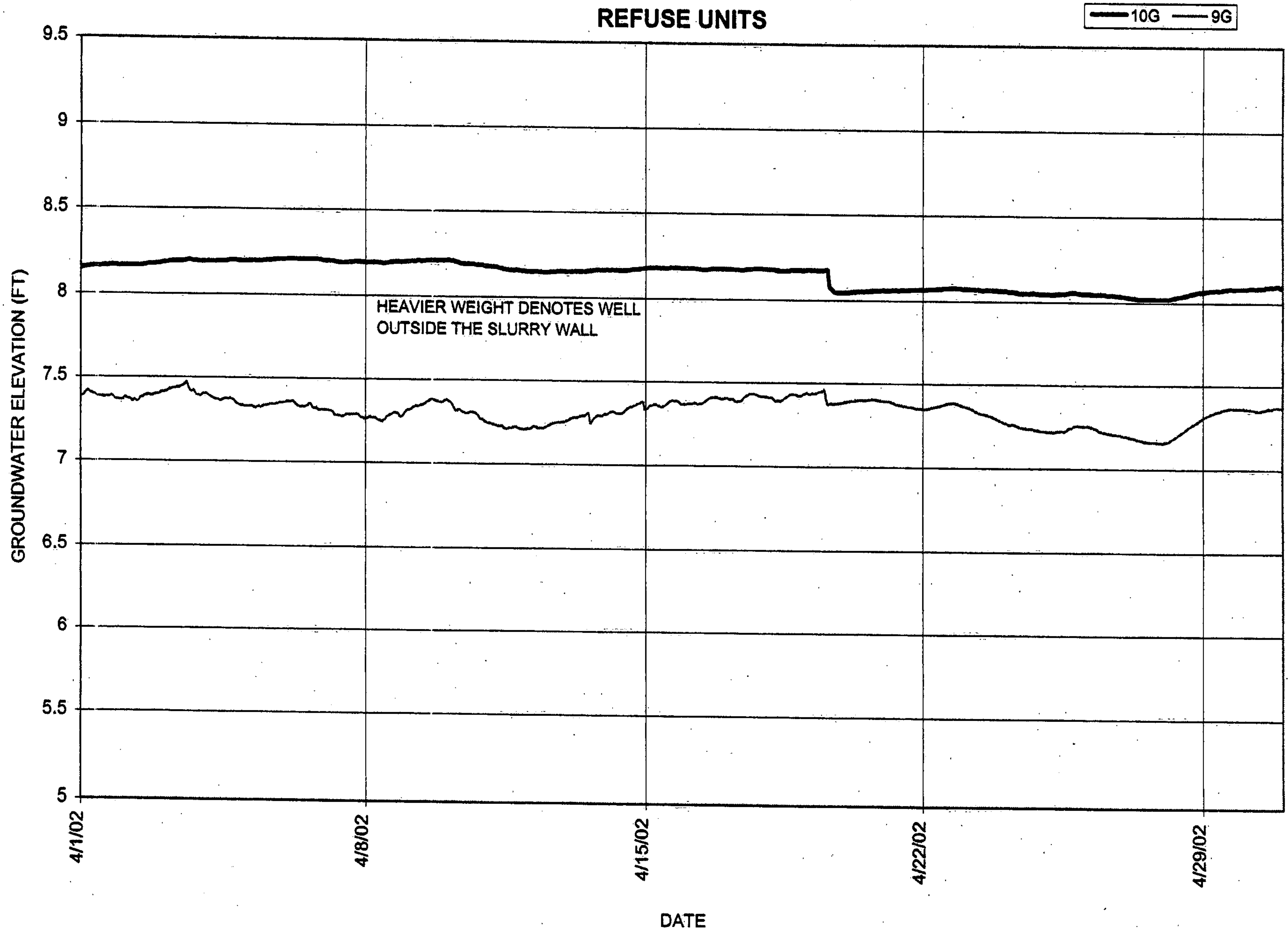
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #5
TRANSECT No.5
REFUSE UNITS



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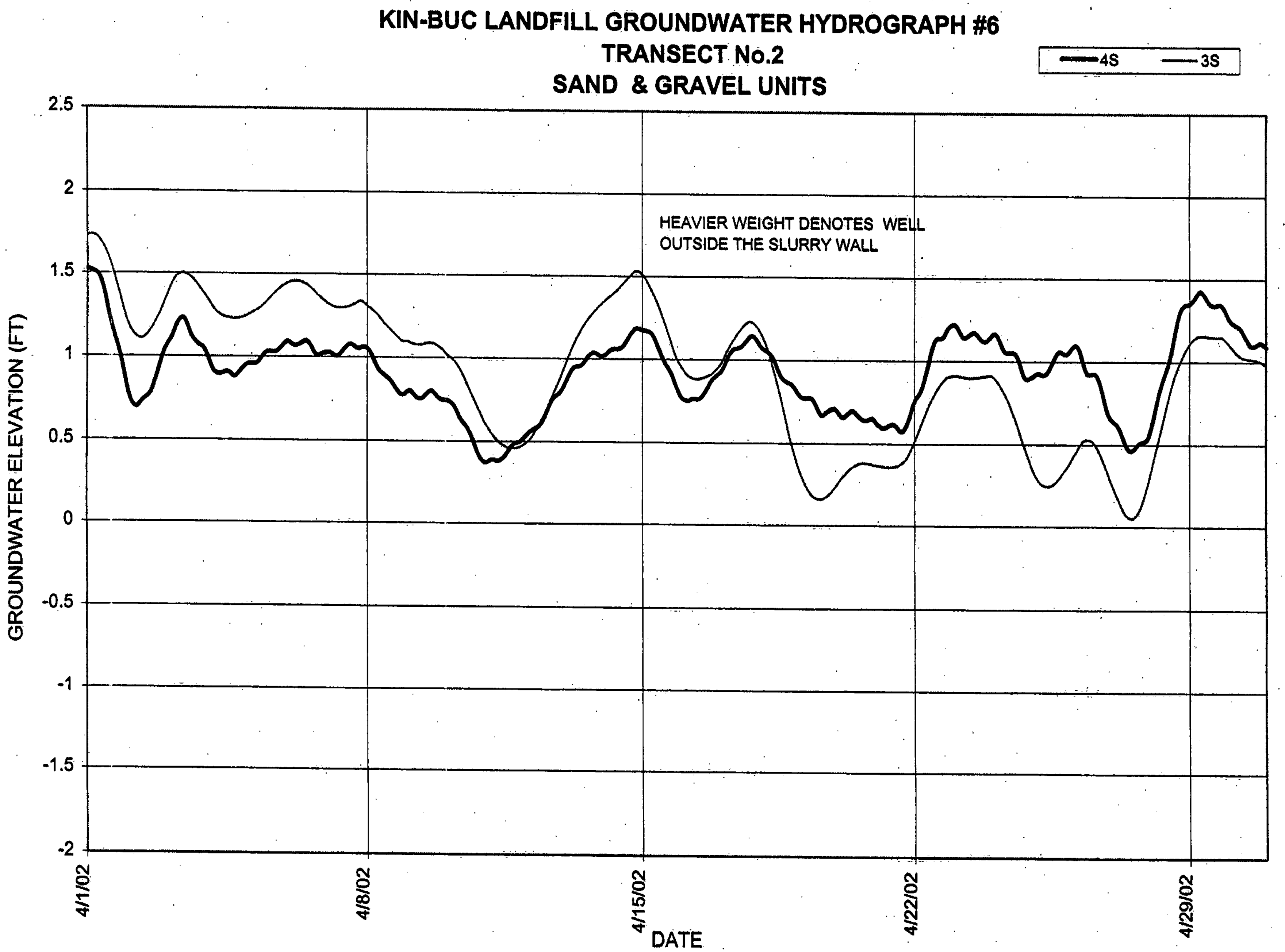

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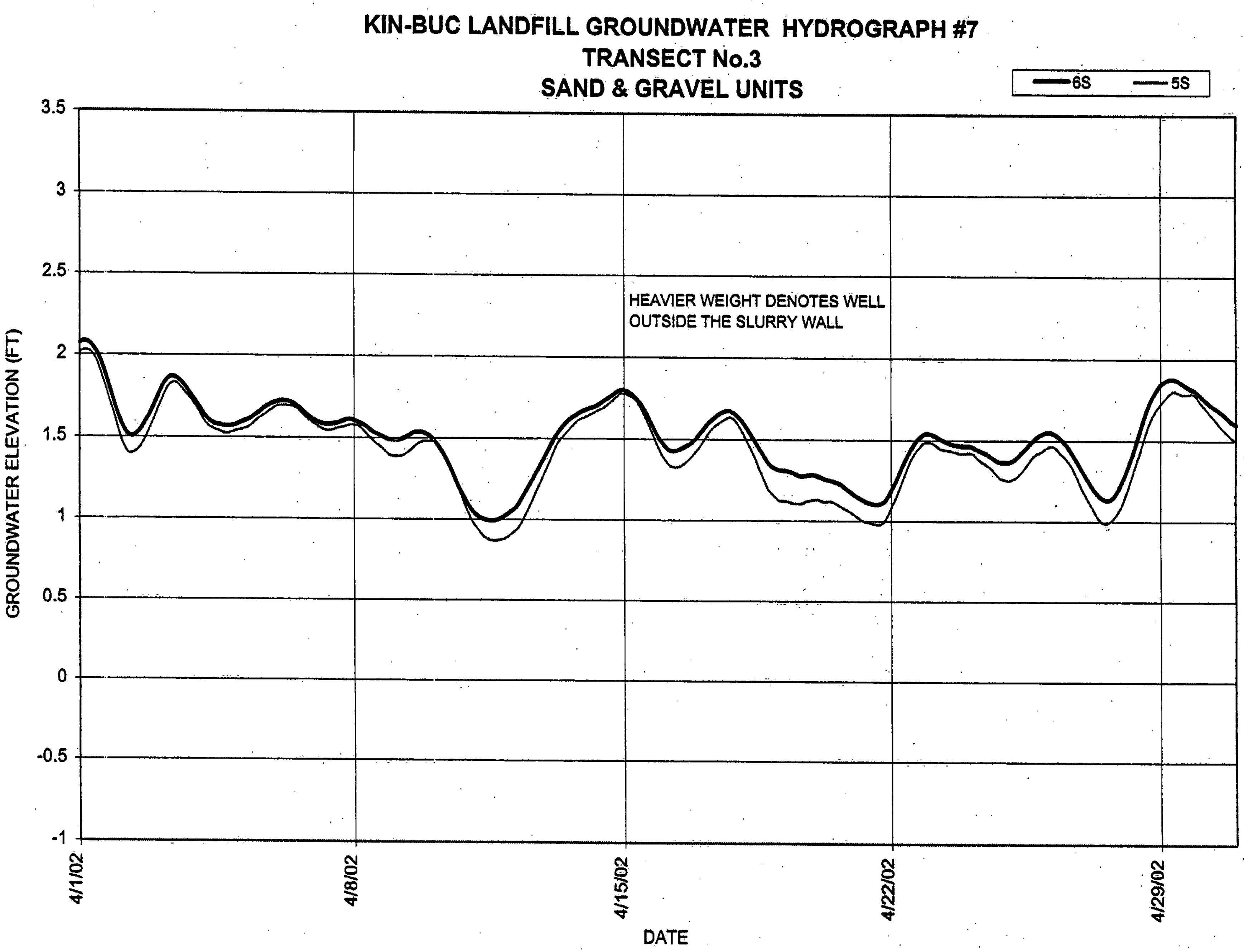

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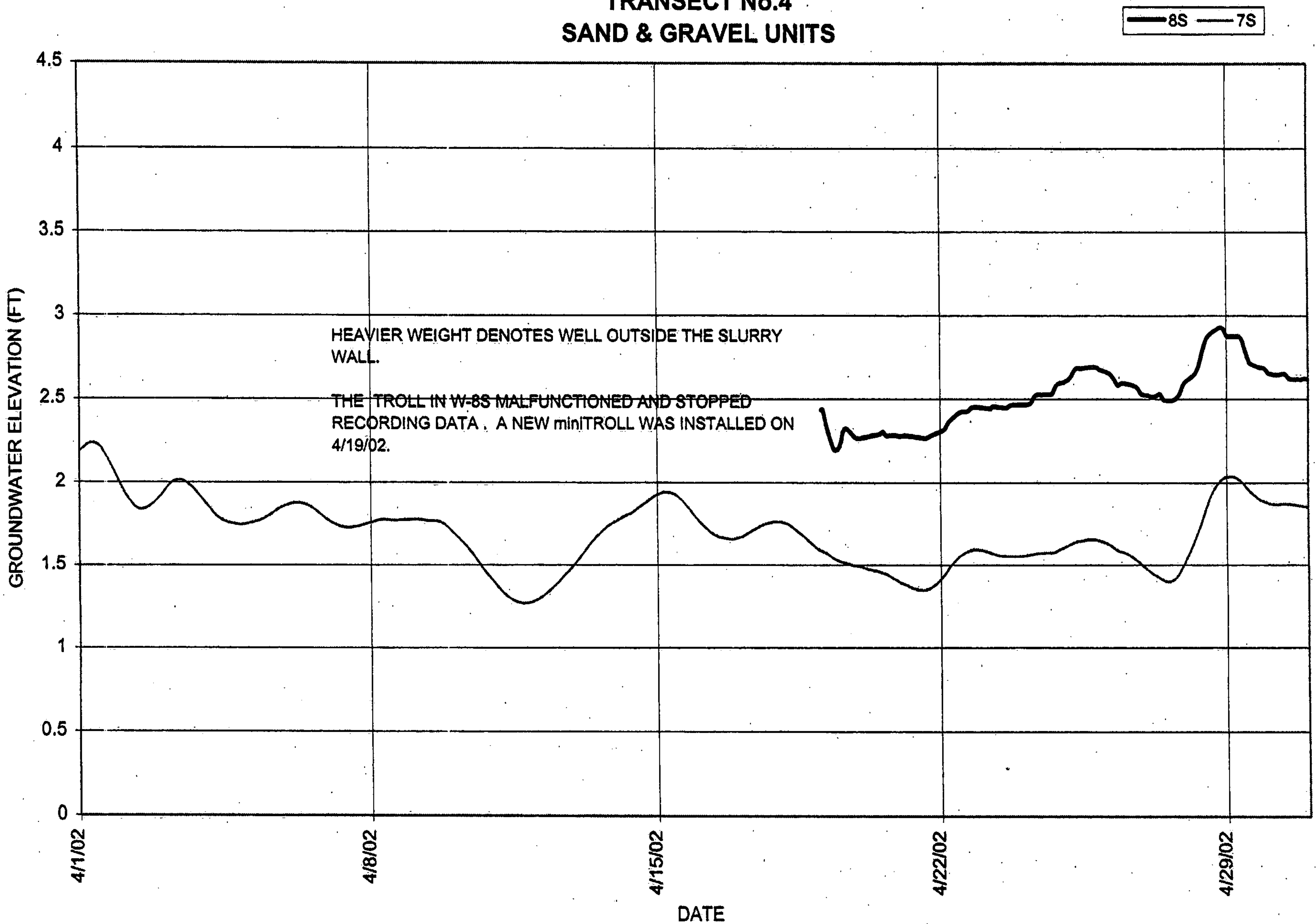
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #8
TRANSECT No.4
SAND & GRAVEL UNITS



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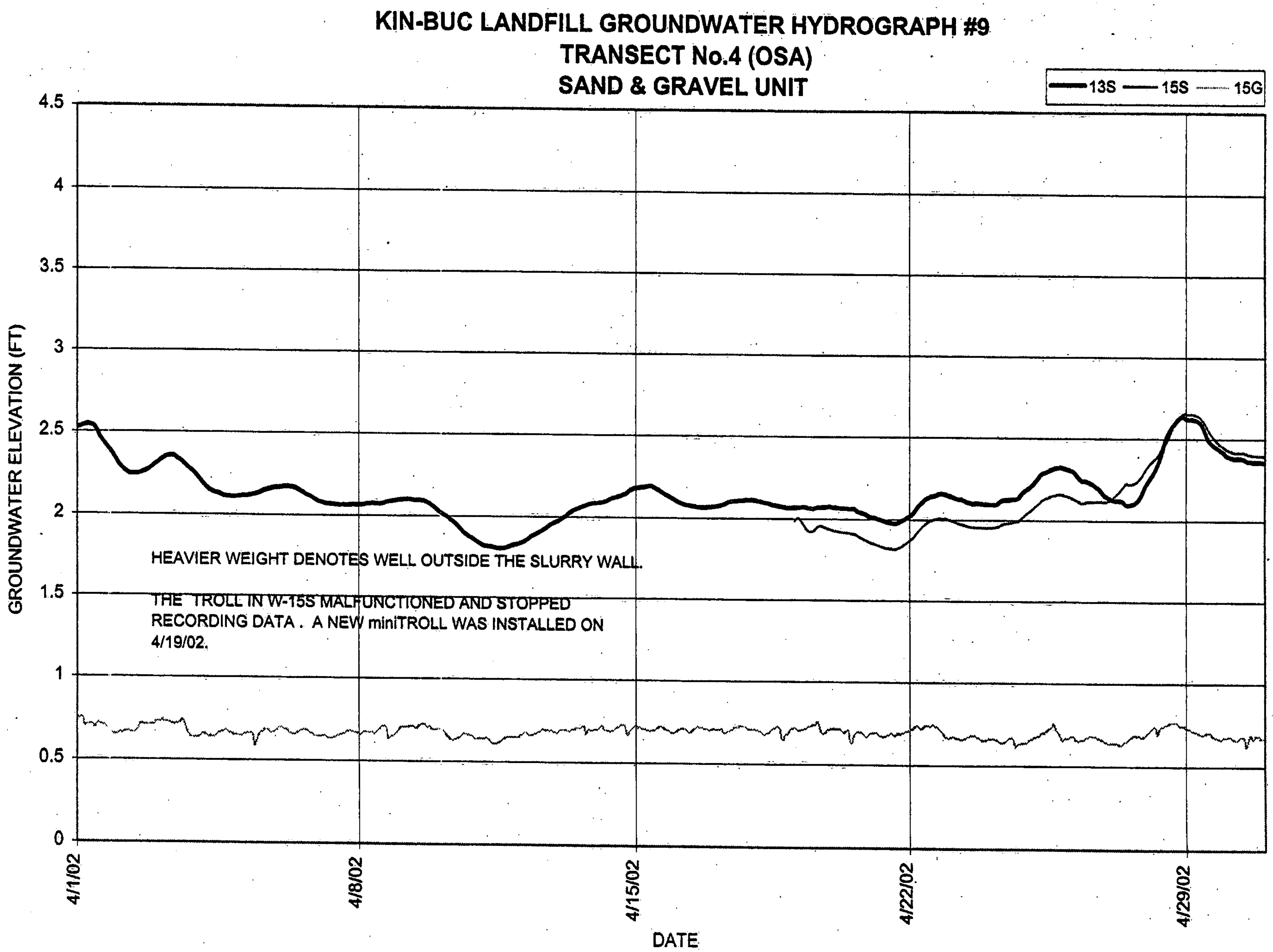

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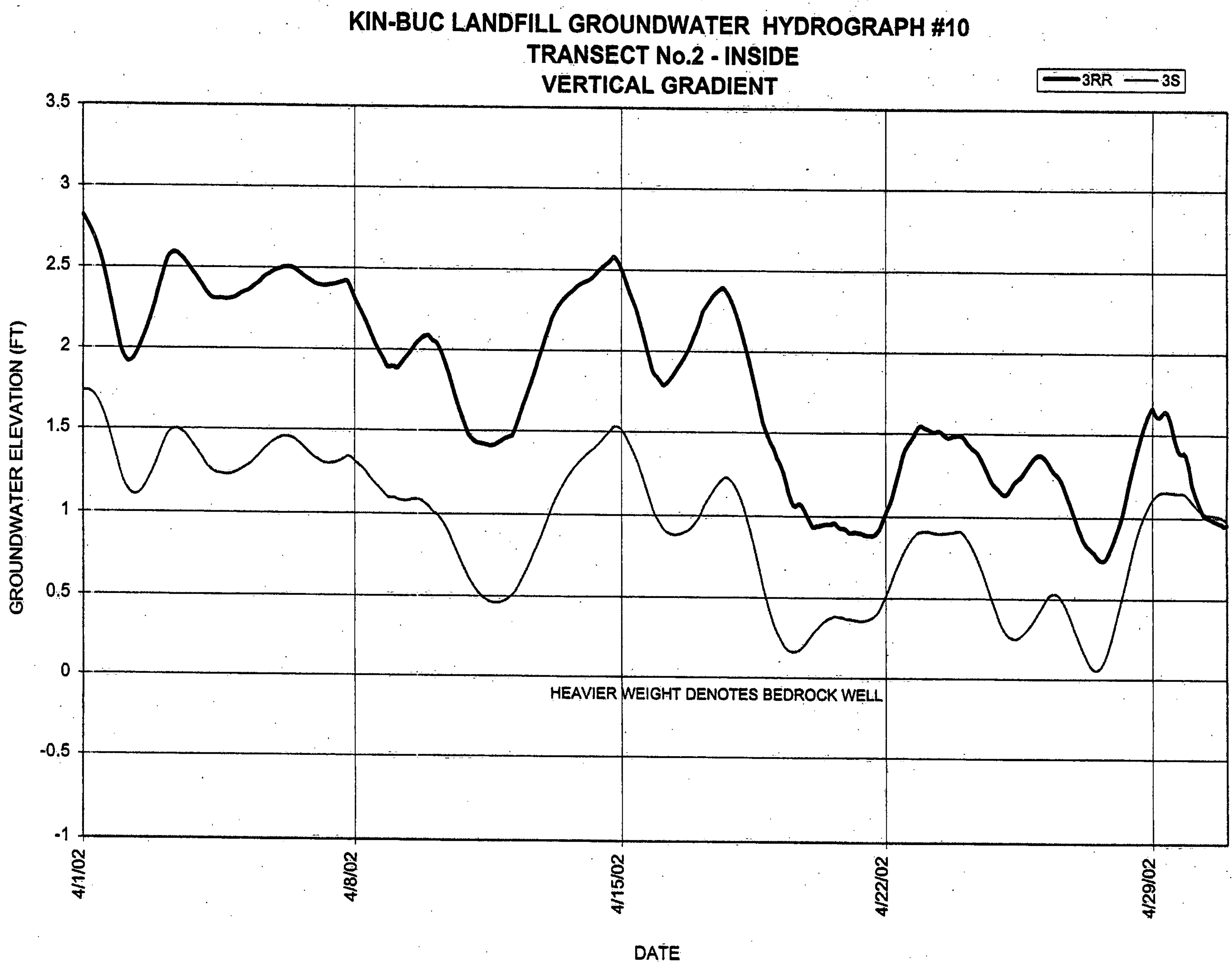

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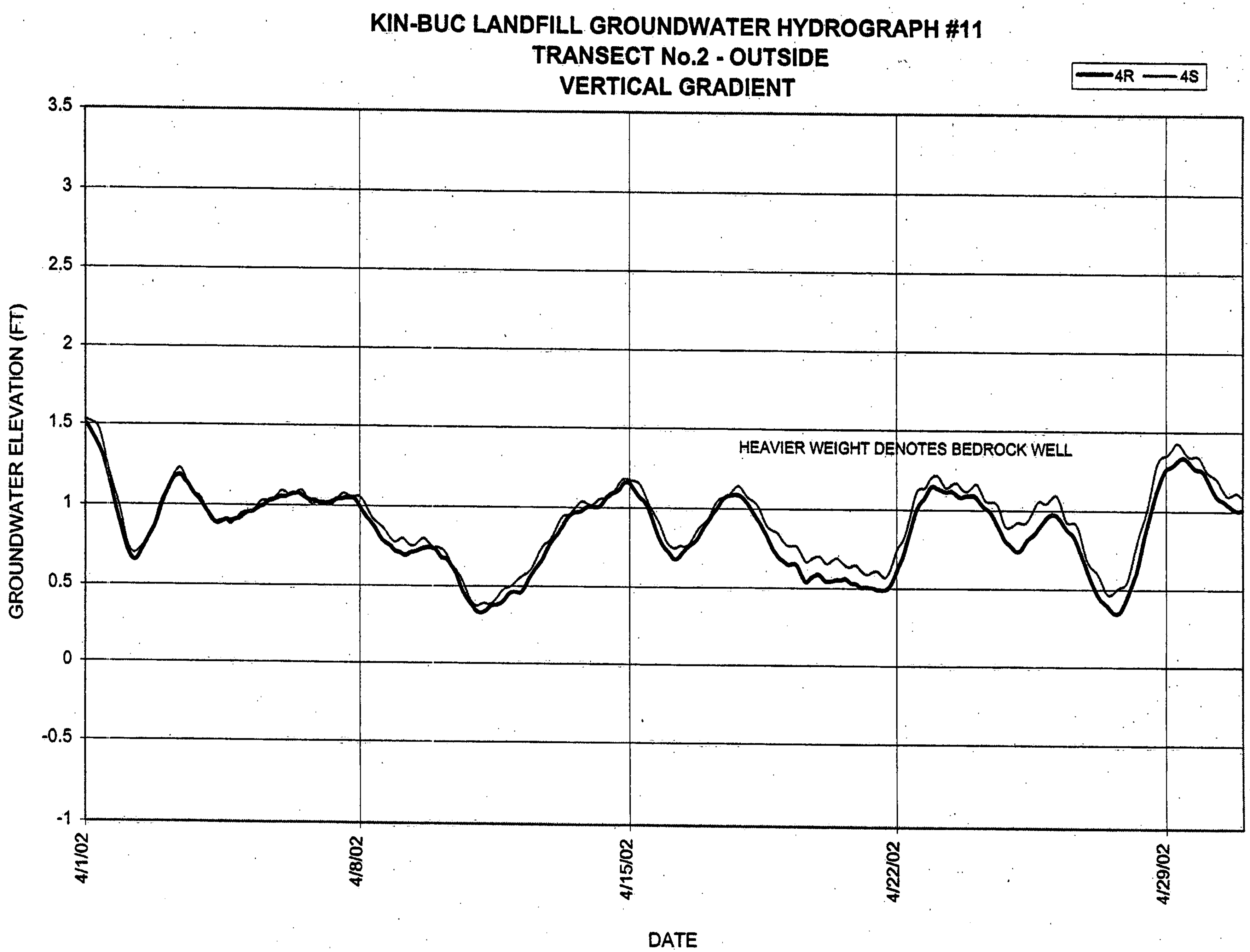

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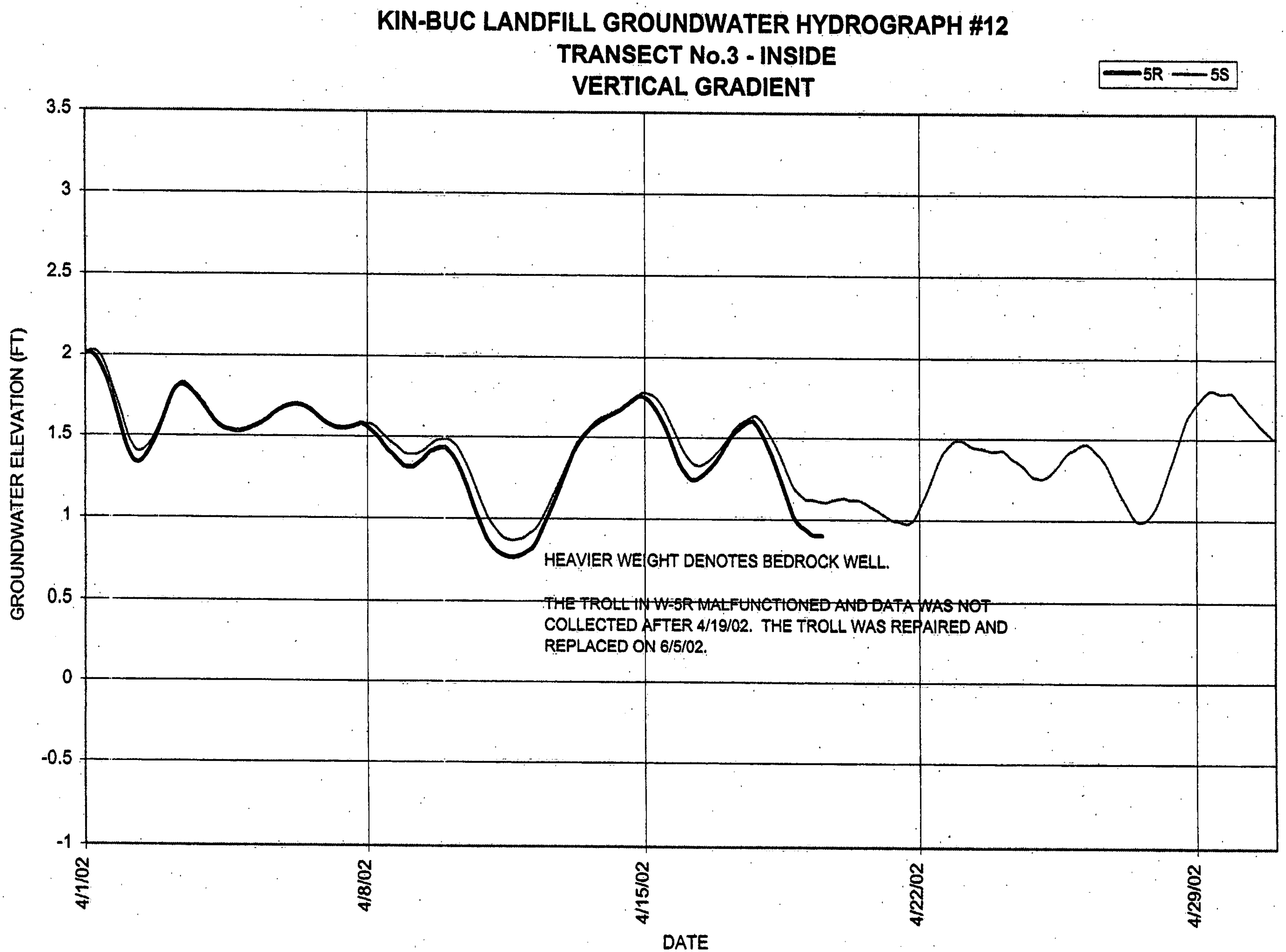

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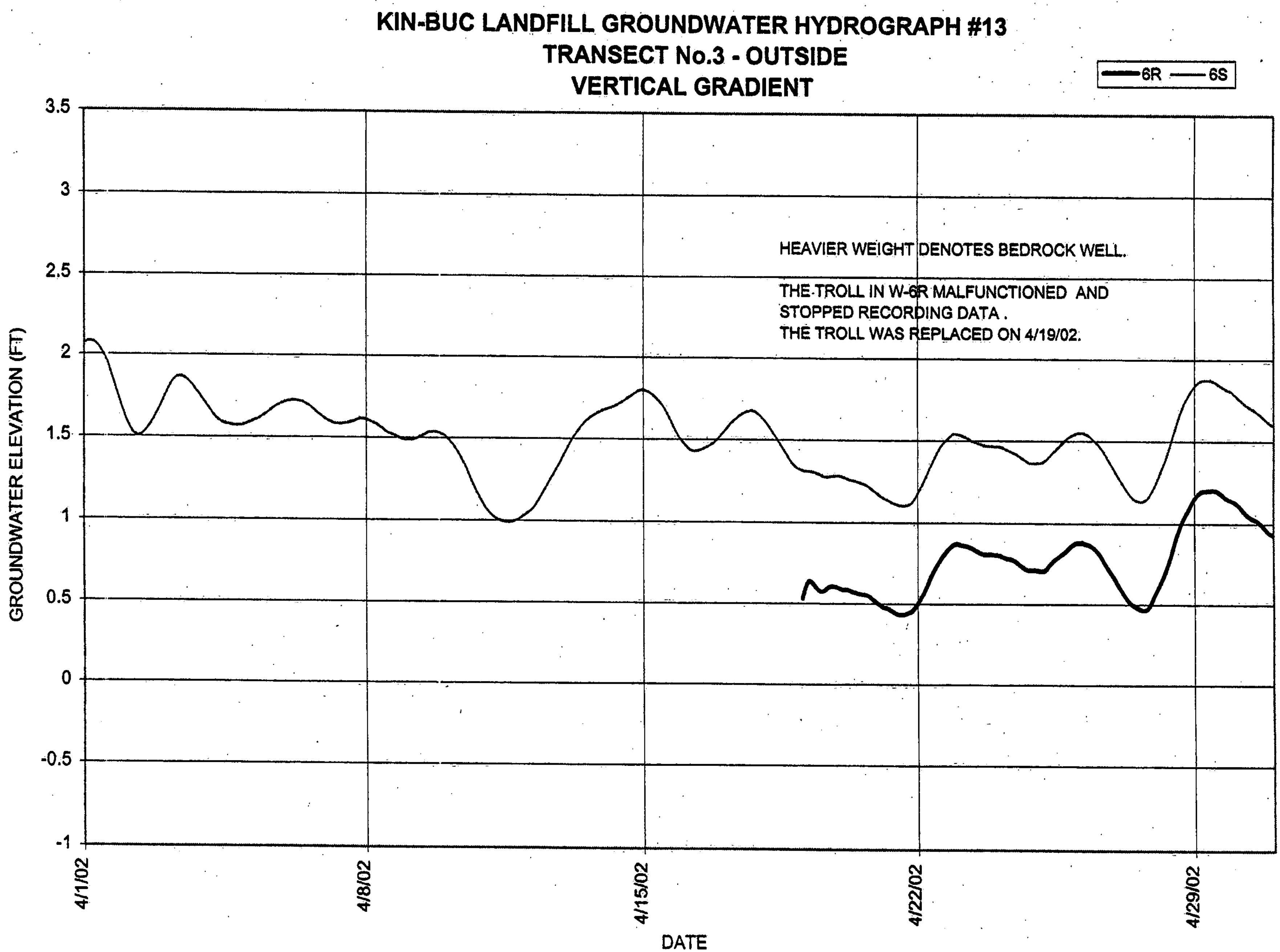

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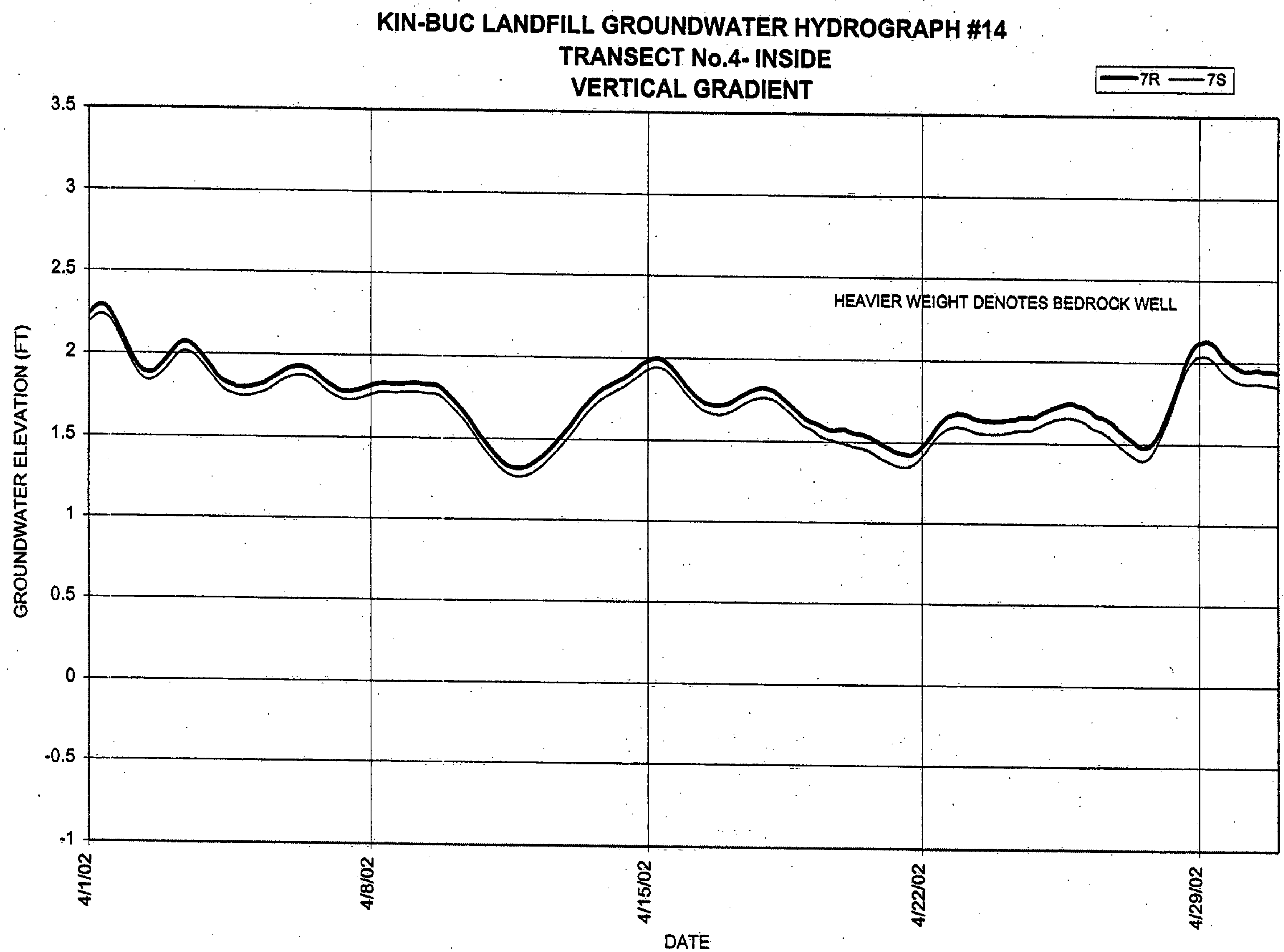

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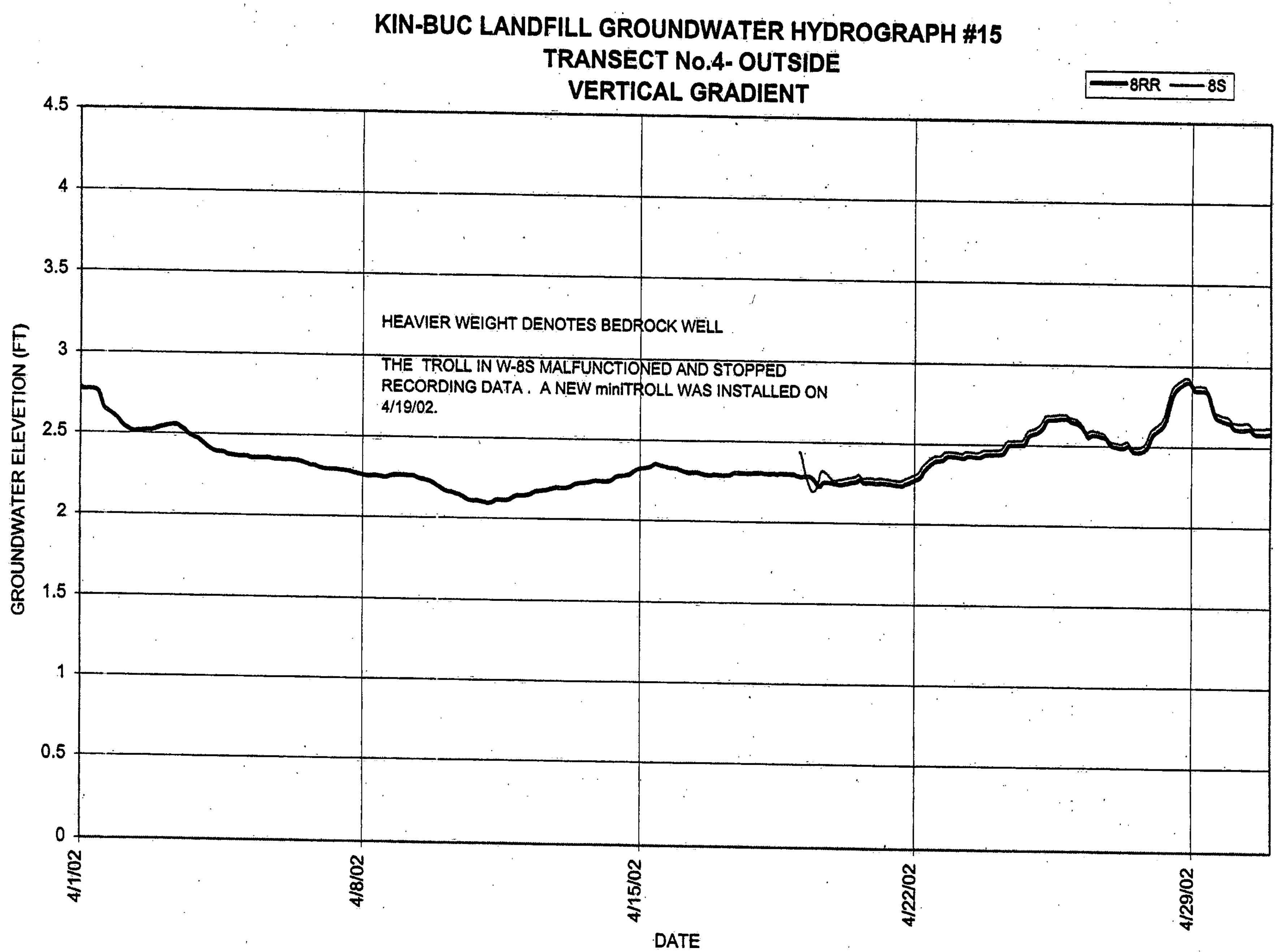

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Shaw Environmental & Infrastructure, Inc.

Crossroads Corporate Center
One International Boulevard Suite 700
Mahwah NJ 07495-0086
201 512 5700
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Shaw The Shaw Group Inc.

June 18, 2002
Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, New Jersey 08817

Re: Hydraulic Control at OU1

Dear Mr. Januszkiewicz:

During January-February 2000 aquifer testing was performed at the Kin-Buc landfill site to better define the hydrogeologic flow conditions within OU1, with particular emphasis on the sand and gravel and bedrock unit and to determine the optimal extraction scenario required to demonstrate hydraulic containment. In July 2000, IT Corporation prepared a Groundwater Pumping Well Performance Evaluation Report. The major conclusions of the evaluation were as follows:

- Hydraulic control of OU-1 could be achieved by pumping sand and gravel well No. 2 (S&G-2) at 21.5 gallons per minute but indicated that considerably lower pumping rates could achieve the same objective.
- Flow rates can be minimized and the lateral extent of groundwater capture can be maximized by maintaining 2 pumping centers, S&G-2 and S&G-3.
- Hydraulic control of OU1 can be optimized by pumping S&G-2 at 10,000 gpd and S&G-3 at 5,000 gpd for a combined daily extraction rate of 15,000 gpd.
- Hydraulic control of OU1 to be evaluated on an annual basis, and flow rates adjusted if necessary to achieve hydraulic control of OU1.

As you are aware, the consistent attainment of intragradient conditions, in particular within the sand and gravel unit, at Transect No 2 has not been achievable. On June 12, 2002, a meeting was held at the site with U.S. Filter and MWO Environmental Engineering & Consulting, P.C. to discuss the hydraulic performance of OU1. Based on our discussions, and in keeping with the recommendation to annually evaluate the pumping and performance at OU1, the following course of action is proposed.

Groundwater extraction at S&G-2 will be increased to a consistent pumping rate of approximately 15 gpm while the pumping rate at S&G-3 will be maintained at

approximately 6 gpm. This rate should be maintained to the extent feasible based on steady state pumping, 24 hours/day, 7 days per week. It is recommended that this pumping schedule be maintained for a minimum 2 week period to achieve stabilization of groundwater conditions. If hydraulic control is maintained than consideration can be given to proportionately reducing the pumping rates to determine if hydraulic control can be maintained at lower rates. While these rates are twice those recommended to achieve hydraulic control in the aquifer test, it would be appropriate to assess conditions at the higher rates recommended herein, and scale back the pumping accordingly, based on the results of the hydraulic monitoring.

The above recommendations assume that pumping rates should be maintained on a consistent basis since the premise of the hydrogeologic analysis in terms of hydraulic control assumes continuous (24 hour per day) pumping.

If you have any questions, please do not hesitate to call.

Sincerely,

SHAW ENVIRONMENTAL AND INFRASTRUCTURE

Steven Goldberg

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Attachments

cc: Glenn Grieb, US Filter
Michael O'Hara, MWO Engineering
Adam Licardi/Michael Schumaci, EMCON/OWT

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EMCON/OWT, Inc.
A Shaw Group Company

July 1, 2002
Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

FILE COPY

Re: Hydraulic Monitoring for May 2002

Dear Mr. Januszkiewicz:

A site visit was completed on June 5, 2002 to download water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of May 2002 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by mid August.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. The continuous water level elevation data when compared with manual readings indicated that the Trolls are functioning properly and are recording accurate data. All Troll Data Logger 4000's have been upgraded to new miniTrolls during the site visits of March 27, 2002 and April 19, 2002. Due to complications with the programming of the new data loggers, Trolls in wells W-1G, W-2G, W-3G, W-6G, W-6R, W-8S, and W-15S did not start collecting data until April 19, 2002. Also, the Troll in Well 5R malfunctioned and was sent back to In-Situ for warranty repairs. This Troll was replaced during the site visit June 5, 2002.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference.

The water levels in wells on the outside of the slurry wall vary significantly over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 shows the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Transect 1

Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were observed from May 3, 2002 through the duration of the month. The average monthly water elevation for May at Well 1G (inside) and Well 2G (outside) was 11.07 and 12.30 feet msl, respectively. The straight line on the hydrograph indicates that Well 2G was dry until May 3, 2002, which was confirmed by manual water level measurements taken on April 19, 2002 and May 3, 2002.

The data shows intragradient conditions based on water levels from the wells alone. Historically head levels have been higher inside the wall relative to outside the wall. Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 2, and indicate that the leachate collection system is functioning properly.

Transect 2

Refuse (3G/4G)/Hydrograph No. 2 – Intragradient conditions were maintained throughout the month. The April 19, 2002 manual water elevation readings for Well 3G (inside) and Well 4G (outside) was 9.83 and 11.29 feet msl, respectively. The average monthly water elevation for the month of May at Well 3G (inside) and Well 4G (outside) was 9.84 and 11.22 feet msl, respectively. The manual water elevations for April and the hydrograph indicate intragradient conditions were observed.

Sand and Gravel (3S/4S)/Hydrograph No. 6 - Intragradient conditions were not consistently maintained throughout the month. However, intragradient conditions were observed for a significant portion of the month of May. The average monthly water elevations for the month of May at Well 3S (inside) and Well 4S (outside) was 0.02 and 0.65 feet msl, respectively.

Vertical Gradient (3S/3RR)-Inside/Hydrograph No. 10 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall until the latter part of May when slight downward gradients were observed. The average monthly water elevation for the month of May at Well 3S (sand & gravel) and Well 3RR (bedrock) was 0.02 and 0.21 feet msl, respectively.

Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 –Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall. The average monthly water elevation for the month of May at Well 4S (sand & gravel) and 4R (bedrock) was 0.65 and 0.55 feet msl, respectively.

Transect 3

Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of May at Well 5G (inside) and Well 6G (outside) was 10.10 and 13.39 feet msl, respectively.

Sand and Gravel (5S/6S)/Hydrograph No. 7 – Slight intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of May at Well 5S (inside) and Well 6S (outside) was 1.04 and 1.18 feet msl, respectively.

Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units inside the slurry wall. The automatic data recorder for well 5R, inside the wall, malfunctioned and data was not collected after April 19, 2002. The April 19, 2002 manual water elevation readings for Well 5S (sand & gravel) and 5R (bedrock) was 0.99 and 0.83 feet msl, respectively. The May 3, 2002 manual water elevation readings for Well 5S (sand & gravel) and 5R (bedrock) was 0.83 and 0.61 feet msl, respectively. The June 5, 2002 manual water elevation reading for Well 5S (sand & gravel) and Well 5R (bedrock) was 1.64 and 0.89 feet msl, respectively.

Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Slight Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall. The April 19, 2002 manual water elevation readings for Well 6S (sand & gravel) and Well 6R (bedrock) was 1.42 and 0.54 feet msl, respectively. The average monthly water elevation for the month of May at Well 6S (sand & gravel) and Well 6R (bedrock) was 1.18 and 1.21 feet msl, respectively. These readings and the hydrograph suggest upward gradient conditions were not observed throughout the month of April, and a slight upward gradient condition was observed during the month of May.

Transect 4

Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of May at Well 15G (inside) and Well 13G (outside) was 1.40 and 6.73 feet msl, respectively.

Sand and Gravel (7S/8S)/Hydrograph No. 8 - Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of May at Well 7S (inside) and Well 8S (outside) was 1.30 and 2.33 feet msl, respectively.

Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 - Intragradient conditions were not consistently maintained throughout the month. Due to an upward gradient between the sand & gravel and refuse units in the oil seeps area, groundwater was not collected from the sand & gravel unit. Water levels from Well W-15G in the refuse unit are included on the hydrograph for comparison. The April 19, 2002 manual water elevation readings for Well 15S (inside) and Well 13S (outside) was 2.06 and 2.15 feet msl, respectively. The average monthly water elevation for the month of May at Well 15S (inside) and Well 13S (outside) was 2.06 and 2.05 feet msl, respectively.

Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month. The average monthly water elevation for the month of May at Well 7S (sand & gravel) and Well 7R (bedrock) was 1.30 and 1.39 feet msl, respectively. The difference in average monthly water elevations was less than 0.2 feet.

Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 – A dominant flow direction was not observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month. The April 19, 2002 manual water elevation readings for Well 8S (sand & gravel) and Well 8RR (bedrock) was 2.35 and 2.22 feet msl, respectively. The average monthly water elevation for the month of May at both Well 8S (sand & gravel) and Well 8RR (bedrock) was 1.33 feet msl.

Transect 5

Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of May at Well 9G (inside) and Well 10G (outside) was 7.18 and 8.16 feet msl, respectively.

Figure 1 shows the hydraulic profile summary for April 2002.

Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from May 1 to May 31, 2002:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
143,665 gal.	99,143 gal.	276,940 gal.	0 gal.	51,825 gal.
4,634 gpd	3,198 gpd	8,934 gpd	0 gpd	1,672 gpd

For the period, a total of 519,748 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 16,766 gpd. The extraction rate from S&G No. 2 was 3,198 gpd, and the extraction rate from S&G No. 3 was 8,934 gpd. The leachate extraction rate of 1,672 gpd was above the recommended rate of 1,500 gpd.

CONCLUSIONS

- Intragradient conditions were maintained in the refuse unit at Transects 1 2, 3, 4, and 5.

- Intragradient conditions were maintained in the sand & gravel unit at Transects 3 and 4. Intragradient conditions were not consistently observed in the sand & gravel unit at Transect 2, although intragradient conditions were observed for a significant portion of the month of May. Intragradient conditions were not consistently observed in the sand & gravel oil seeps area unit at Transect 4.

- Inside the slurry wall, upward gradient conditions were not observed between the bedrock and overlying sand & gravel unit at Transect 3. A slight upward gradient condition was observed at Transect 4. However, at Transect 2 upward gradient conditions were observed between the bedrock and overlying sand & gravel unit until the end of May.

- Outside the slurry wall, upward gradient conditions were not observed between the bedrock and overlying sand & gravel unit at Transect 2. Upward gradient conditions were observed at Transect 3. At Transect 4, a dominant flow direction was not observed between the bedrock and overlying sand & gravel units.

RECOMMENDATIONS

- The leachate collection rate should be maintained at approximately 1,500 gpd.

- Pursuant to our letter of June 18, 2002 (see attached), pumping rates of S&G-2 and S&G-3 will be consistently maintained at approximately 15 gpm and 6 gpm, respectively, to determine if hydraulic control can be maintained. The groundwater elevation data will be evaluated to determine the effectiveness of the new pumping regime on achieving consistent hydraulic control.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

Sincerely,

EMCON/OWT, INC.

Steven Goldberg/ajo

Adam J. Licardi/ajo

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Adam J. Licardi
Environmental Scientist

Attachments

cc: Glenn Grieb, US Filter

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2002 Minimum/Maximum Water Elevations
Second Quarter

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-1G	April	11.07	11.16	11.07	W-2G	April	10.57	10.58	10.58
	May	11.07	11.08	11.07		May	10.57	13.72	12.30
	Apr -May	11.07	11.16	11.07		Apr -May	10.57	13.72	11.83
W-3G	April	9.74	10.24	9.93	W-4G	April	10.88	11.32	11.16
	May	9.59	10.14	9.84		May	10.93	11.51	11.22
	Apr -May	9.59	10.24	9.87		Apr -May	10.88	11.51	11.19
W-3S	April	-0.13	1.96	0.92	W-4S	April	-0.41	2.44	0.92
	May	-2.51	1.58	0.02		May	-0.90	2.26	0.65
	Apr - May	-2.51	1.96	0.46		Apr - May	-0.90	2.44	0.79
W-5G	April	9.85	10.59	10.16	W-6G	April	12.85	13.70	13.24
	May	9.76	10.53	10.10		May	12.84	13.87	13.39
	Apr -May	9.76	10.59	10.13		Apr -May	12.84	13.87	13.33
W-5S	April	0.78	2.27	1.43	W-6S	April	0.86	2.34	1.51
	May	-0.14	1.93	1.04		May	0.17	2.01	1.18
	Apr - May	-0.14	2.27	1.23		Apr - May	0.17	2.34	1.34
W-7S	April	1.21	2.37	1.69	W-8S	April	2.01	4.45	2.53
	May	0.15	2.12	1.30		May	1.67	4.09	2.33
	Apr - May	0.15	2.37	1.49		Apr - May	1.67	4.45	2.38
W-15S	April	1.71	3.15	2.14	W-13S	April	1.63	3.48	2.15
	May	1.33	3.10	2.06		May	1.45	3.01	2.05
	Apr - May	1.33	3.15	2.08		Apr - May	1.45	3.48	2.10
W-15G	April	1.31	1.50	1.41	W-13G	April	6.52	7.03	6.70
	May	1.27	1.50	1.40		May	6.49	7.01	6.73
	Apr -May	1.27	1.50	1.40		Apr -May	6.49	7.03	6.71
W-9G	April	7.16	7.48	7.33	W-10G	April	8.02	8.19	8.12
	May	6.95	7.46	7.18		May	8.07	8.25	8.16
	Apr -May	6.95	7.48	7.25		Apr -May	8.02	8.25	8.14

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2002 Minimum/Maximum Water Elevations
Second Quarter

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-3RR	April	-0.31	3.35	1.77	W-4R	April	-0.70	2.50	0.86
	May	-1.91	1.78	0.21		May	-1.23	2.18	0.55
	Apr - May	-1.91	3.35	0.98		Apr - May	-1.23	2.50	0.70
W-5R	April	0.65	2.26	1.43	W-6R	April	0.28	1.43	0.77
	May	0.00	0.00	#DIV/0!		May	0.25	2.06	1.21
	Apr - May	0.65	2.26	1.43		Apr - May	0.25	2.06	1.09
W-7R	April	1.27	2.41	1.76	W-8RR	April	1.84	4.41	2.38
	May	0.24	2.22	1.39		May	1.67	4.08	2.33
	Apr - May	0.24	2.41	1.57		Apr - May	1.67	4.41	2.36

Note: 1. Troll malfunctioned, data was not collected
2. Water elevation calculated from manual water levels.

Table 2
Kin-Buc Landfill
Leachate Cleanout Monitoring
2002

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.21		10.18		9.97		9.98		na		na
DATE												
12/10/01	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/02	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/02	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/02	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/02	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/02	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na

KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #1
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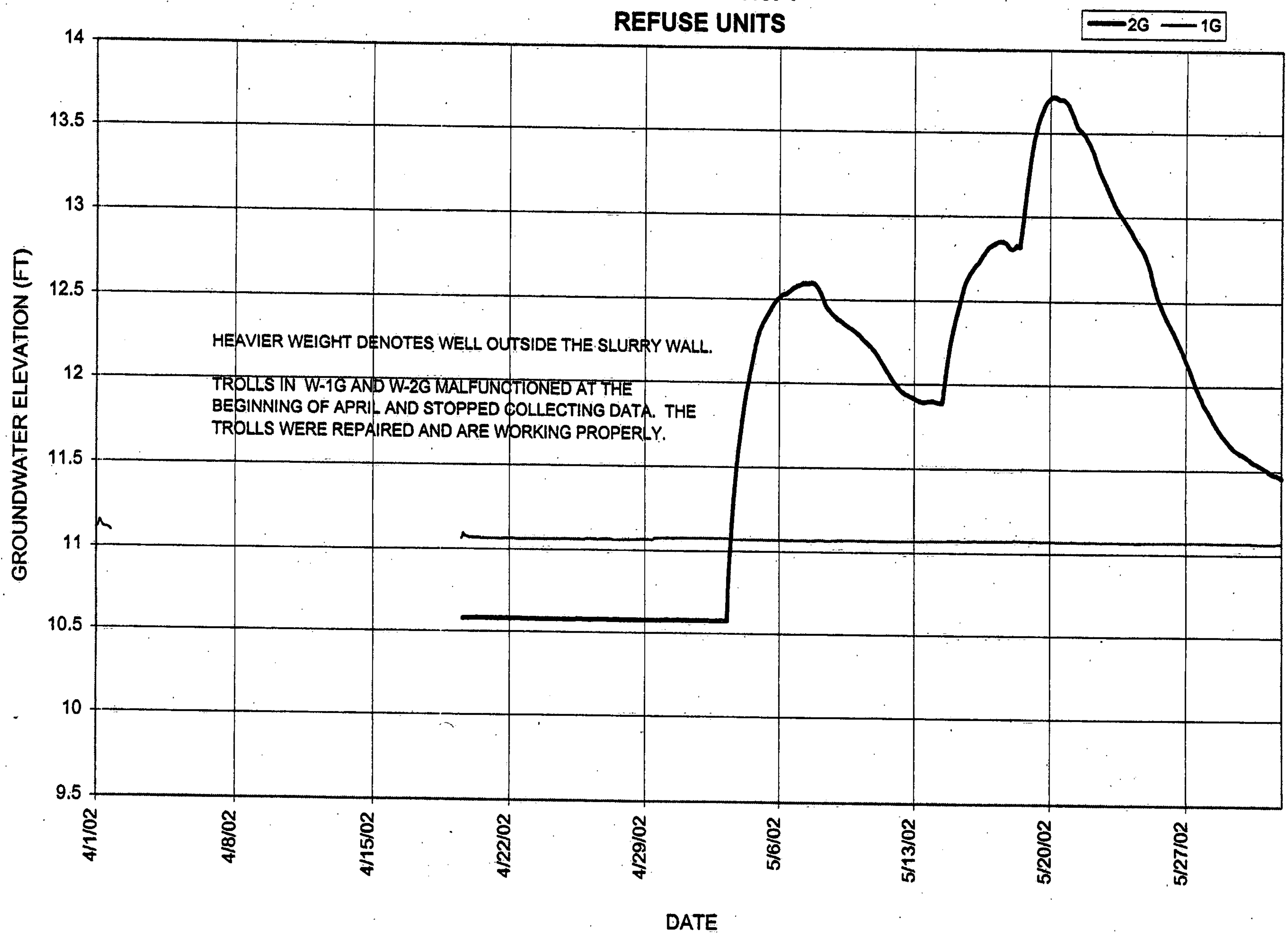

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KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #2
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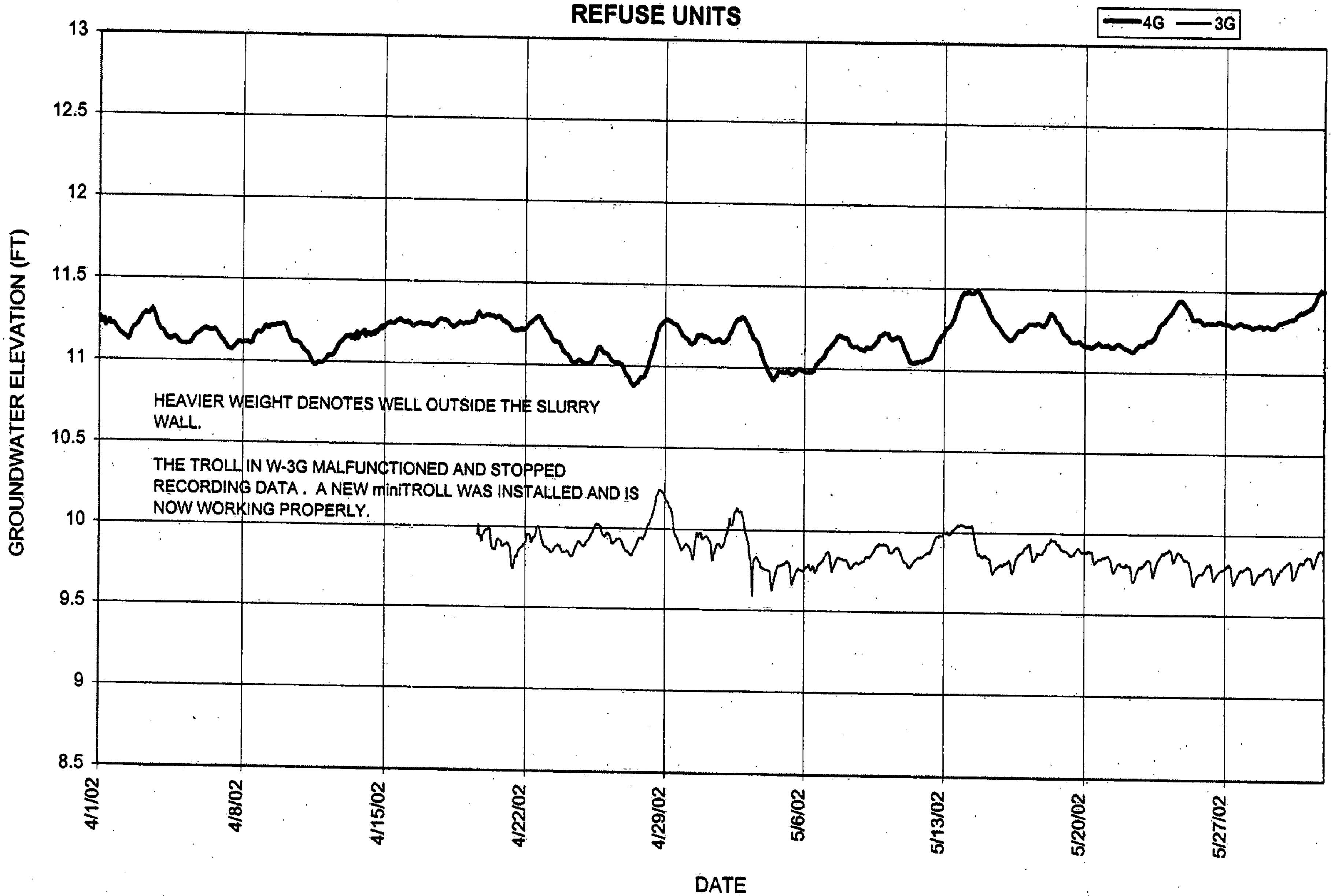
REFUSE UNITS



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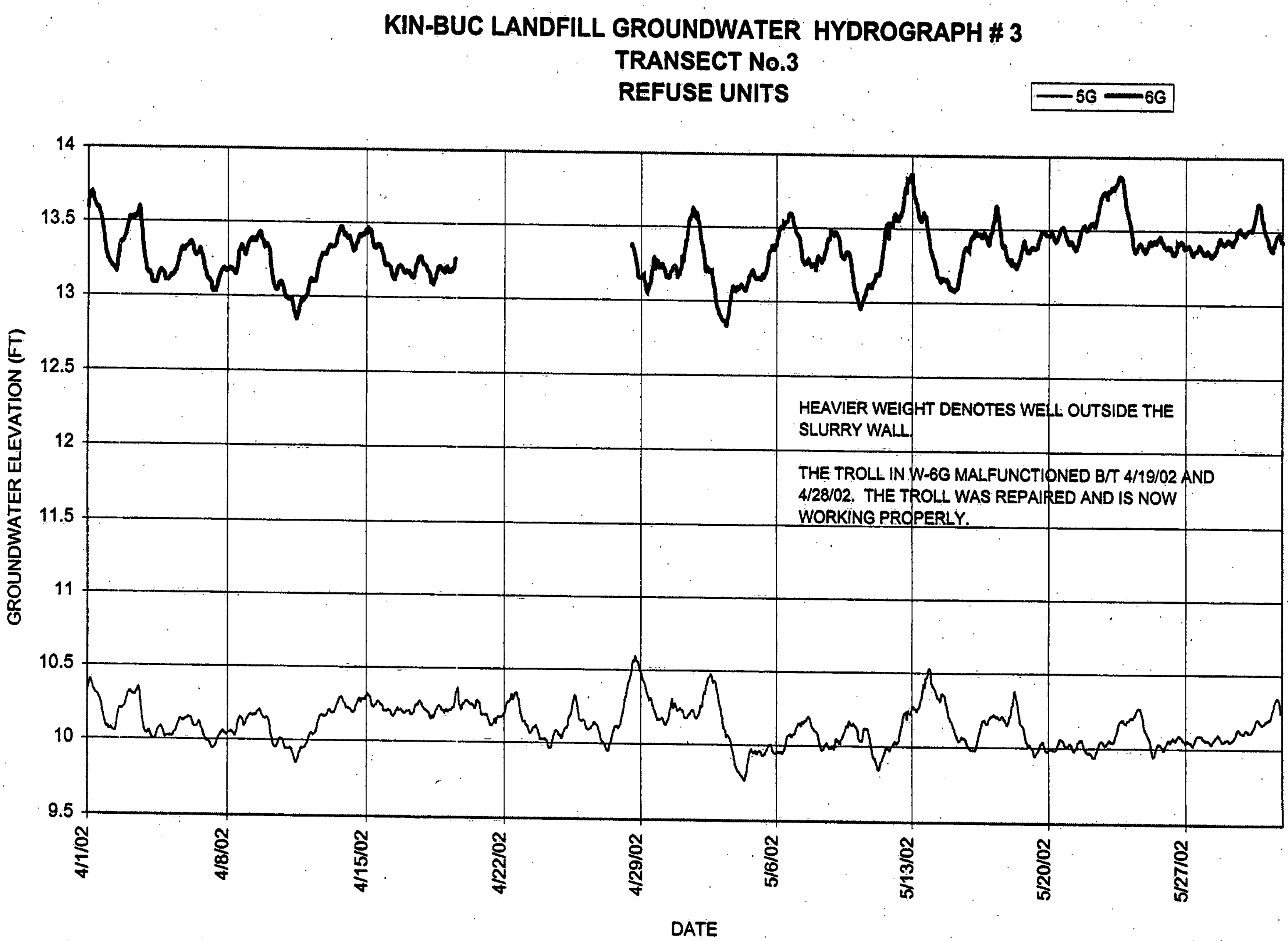

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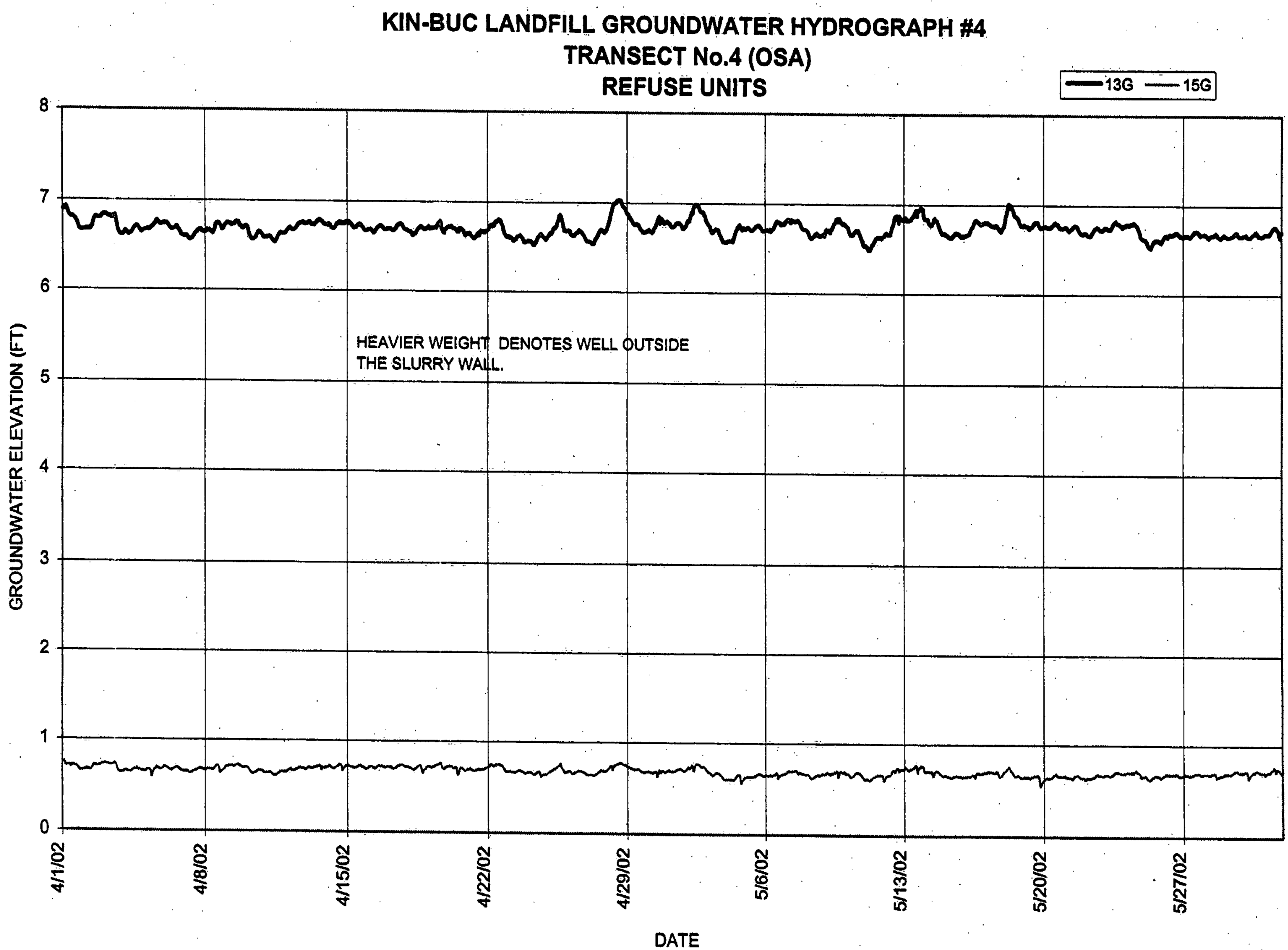

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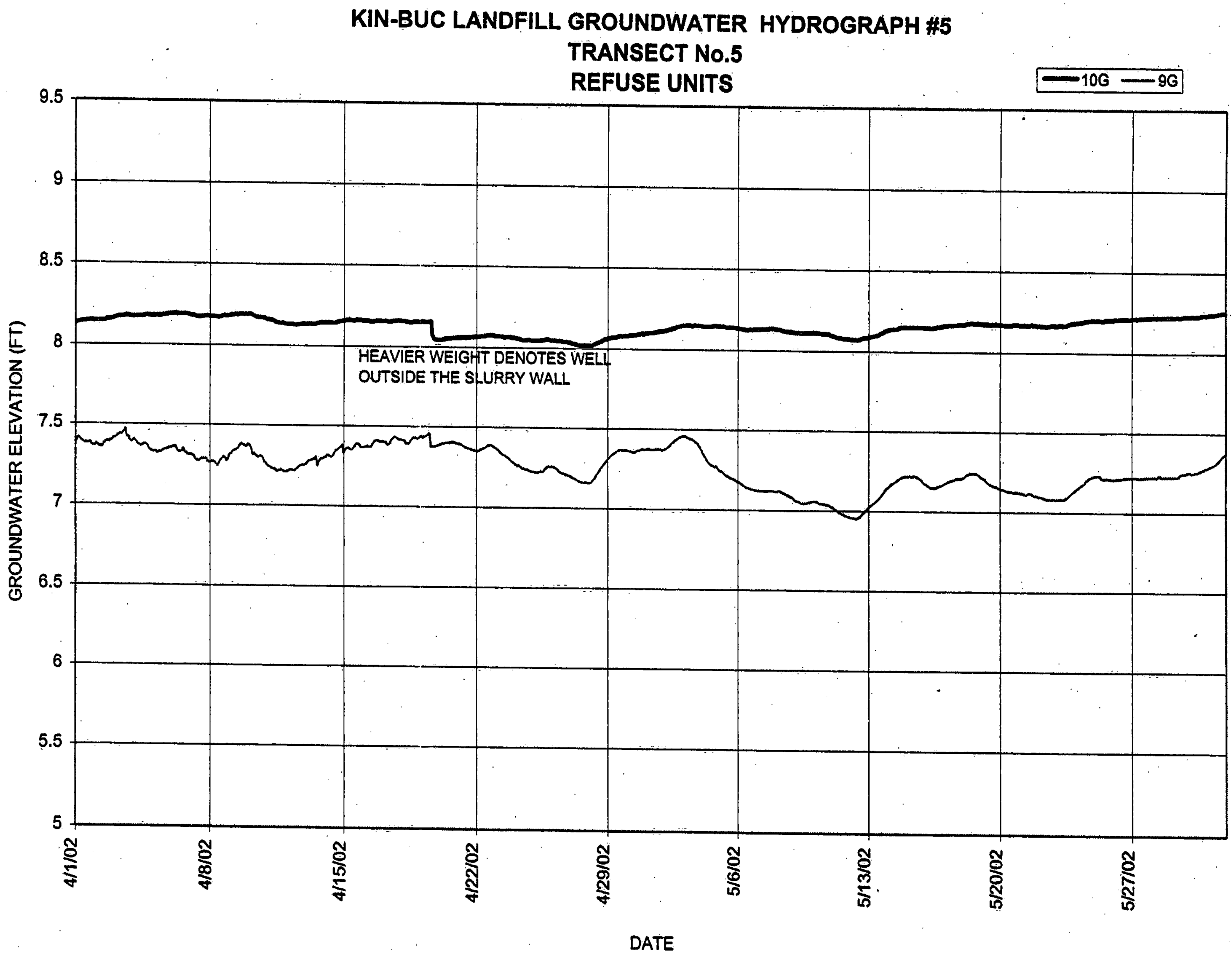

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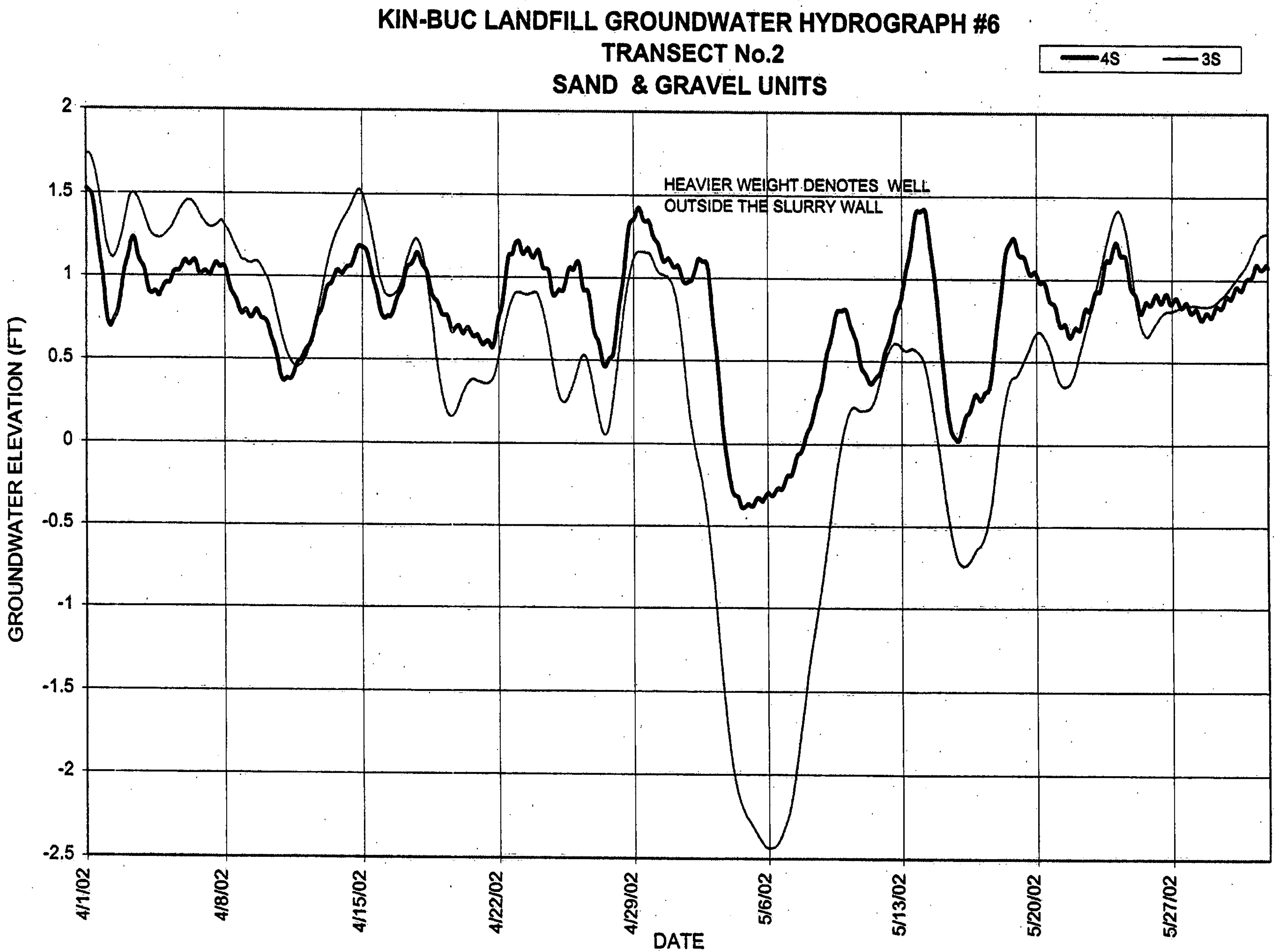

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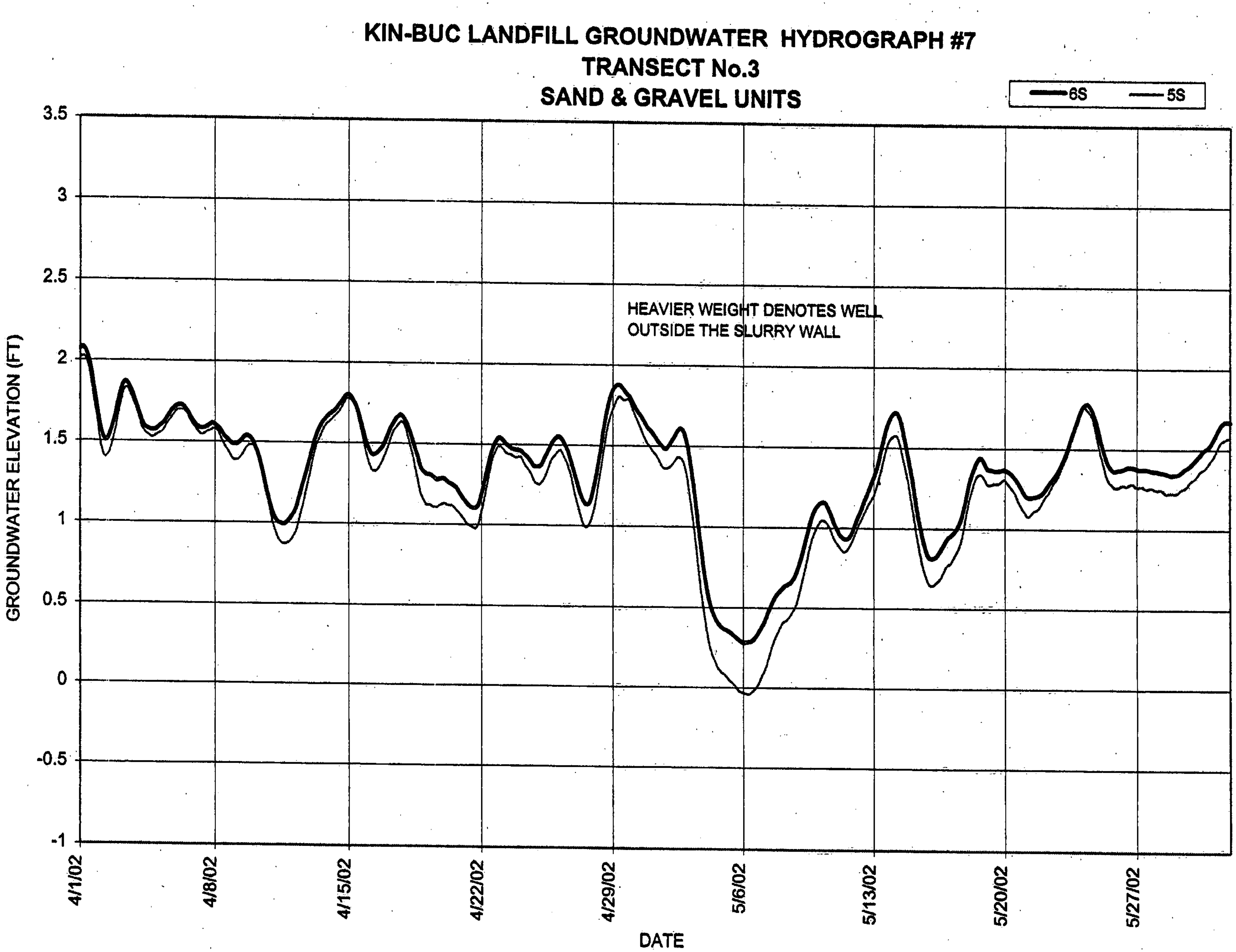

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KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #8
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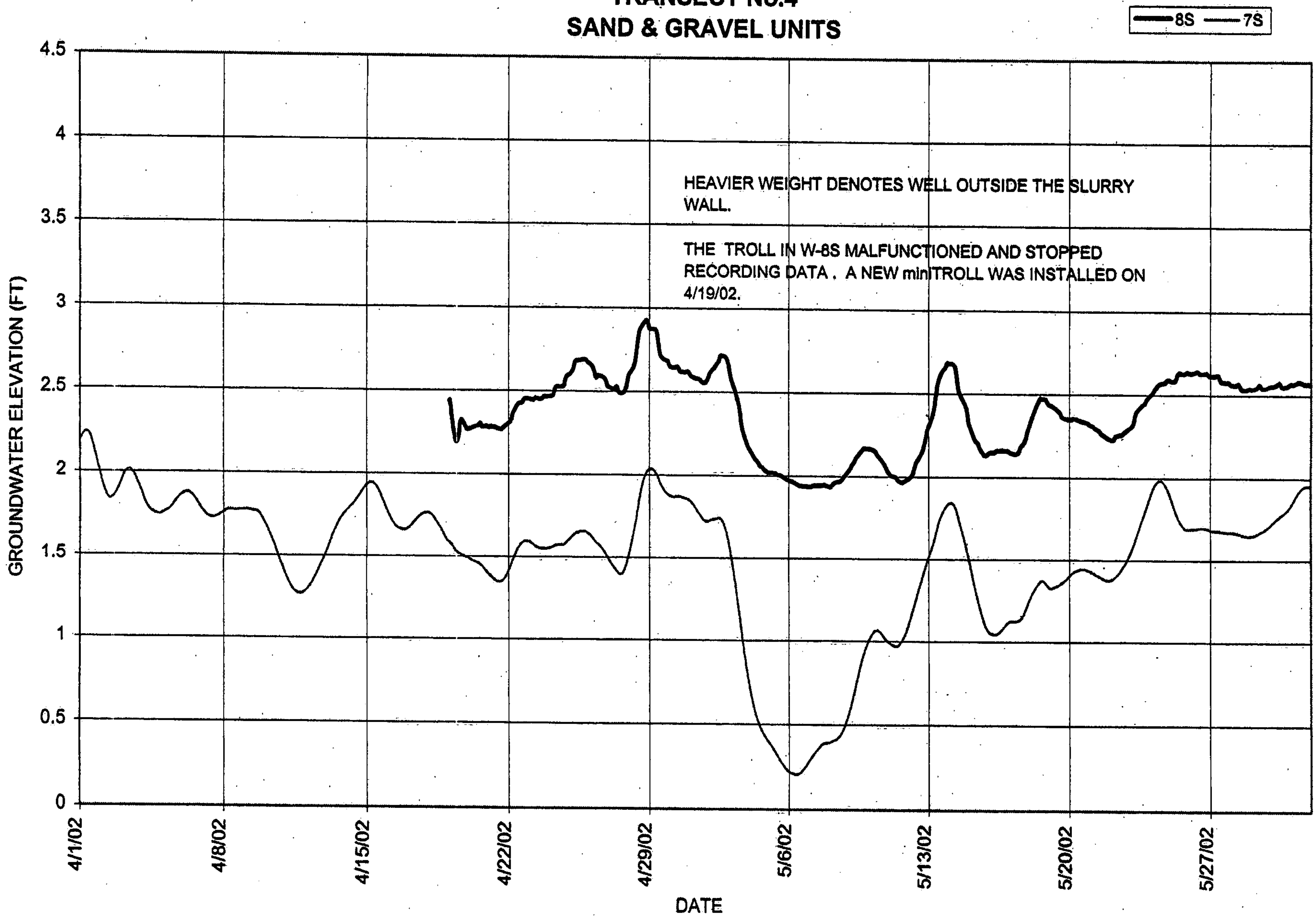
SAND & GRAVEL UNITS



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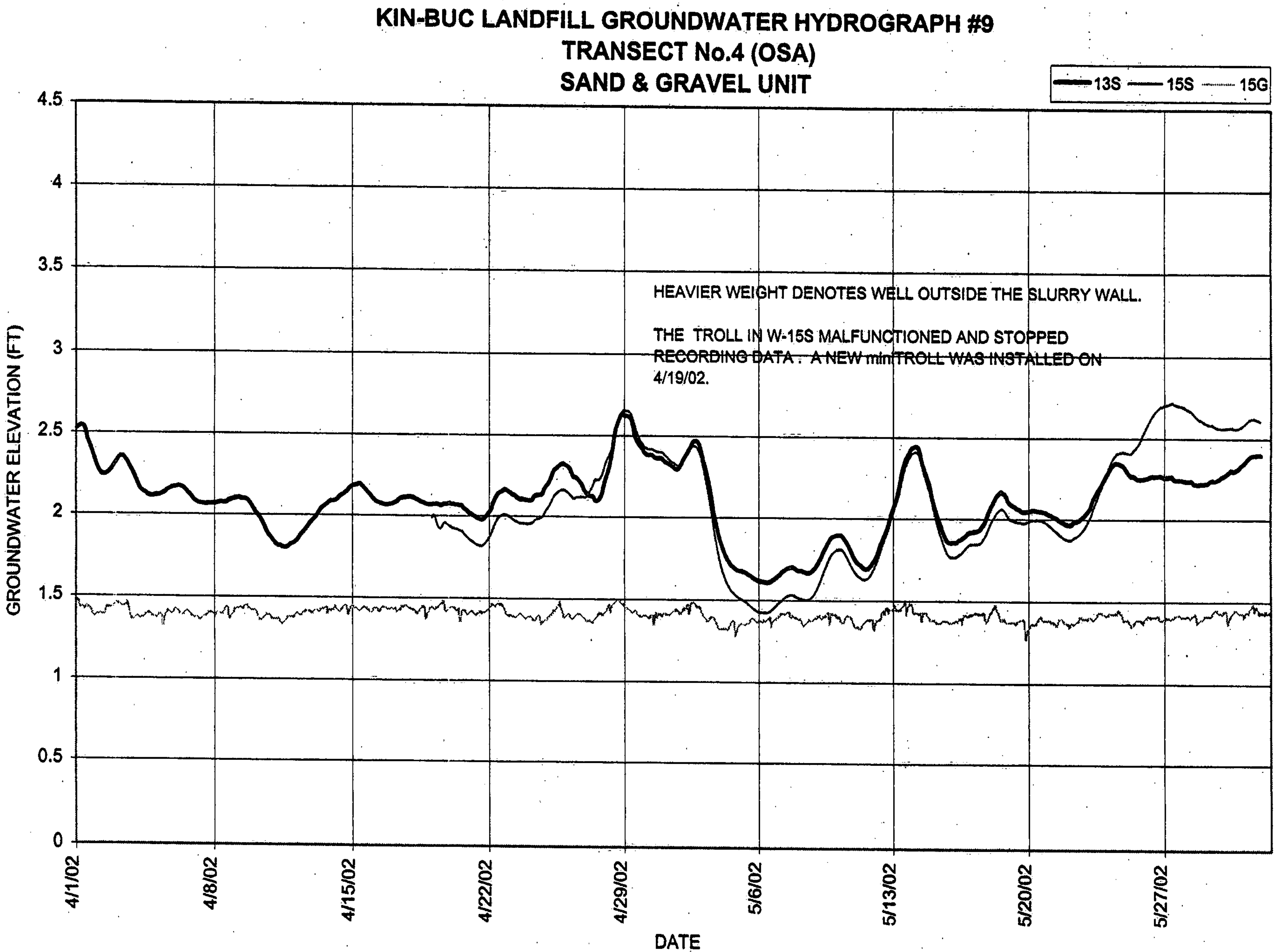

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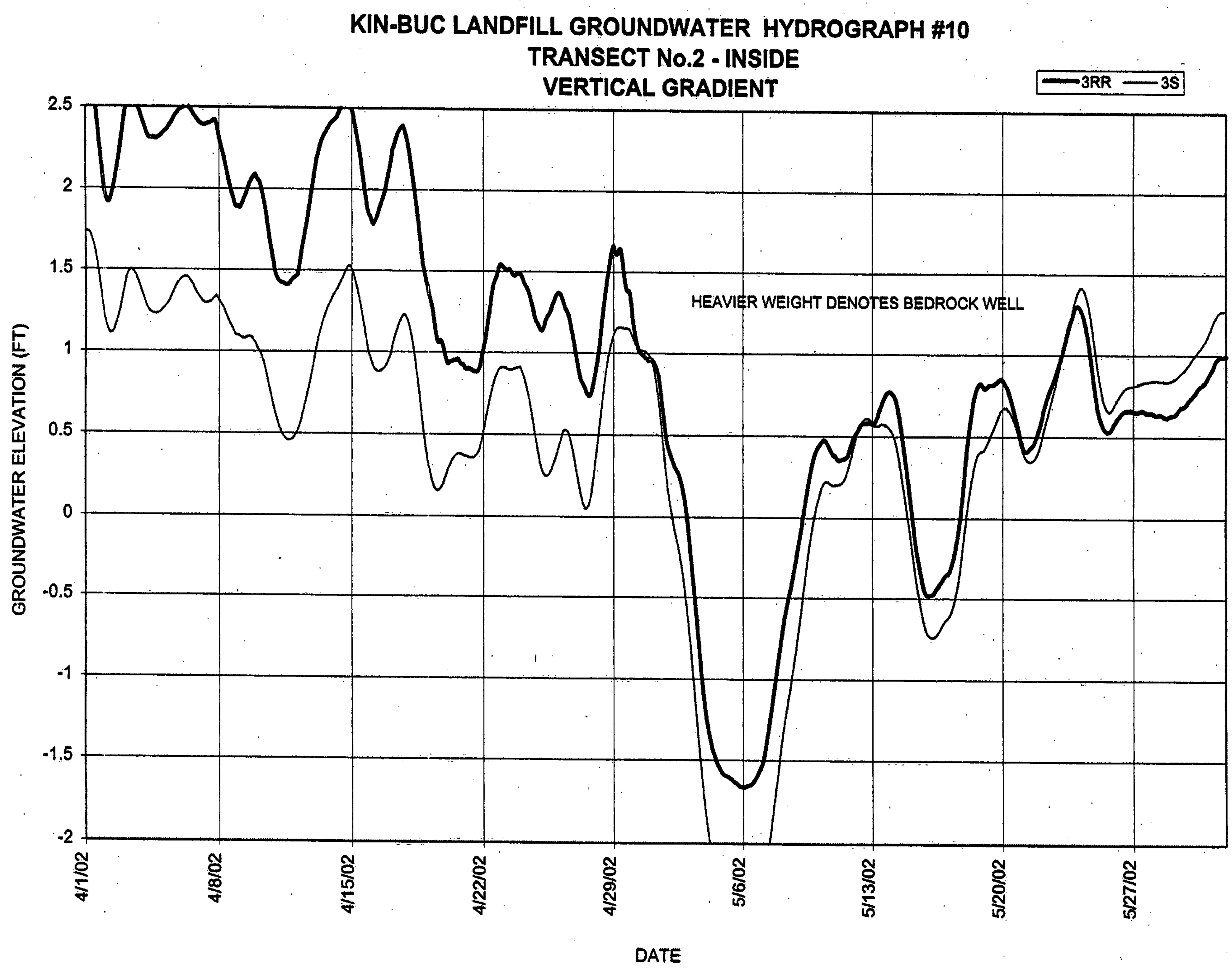

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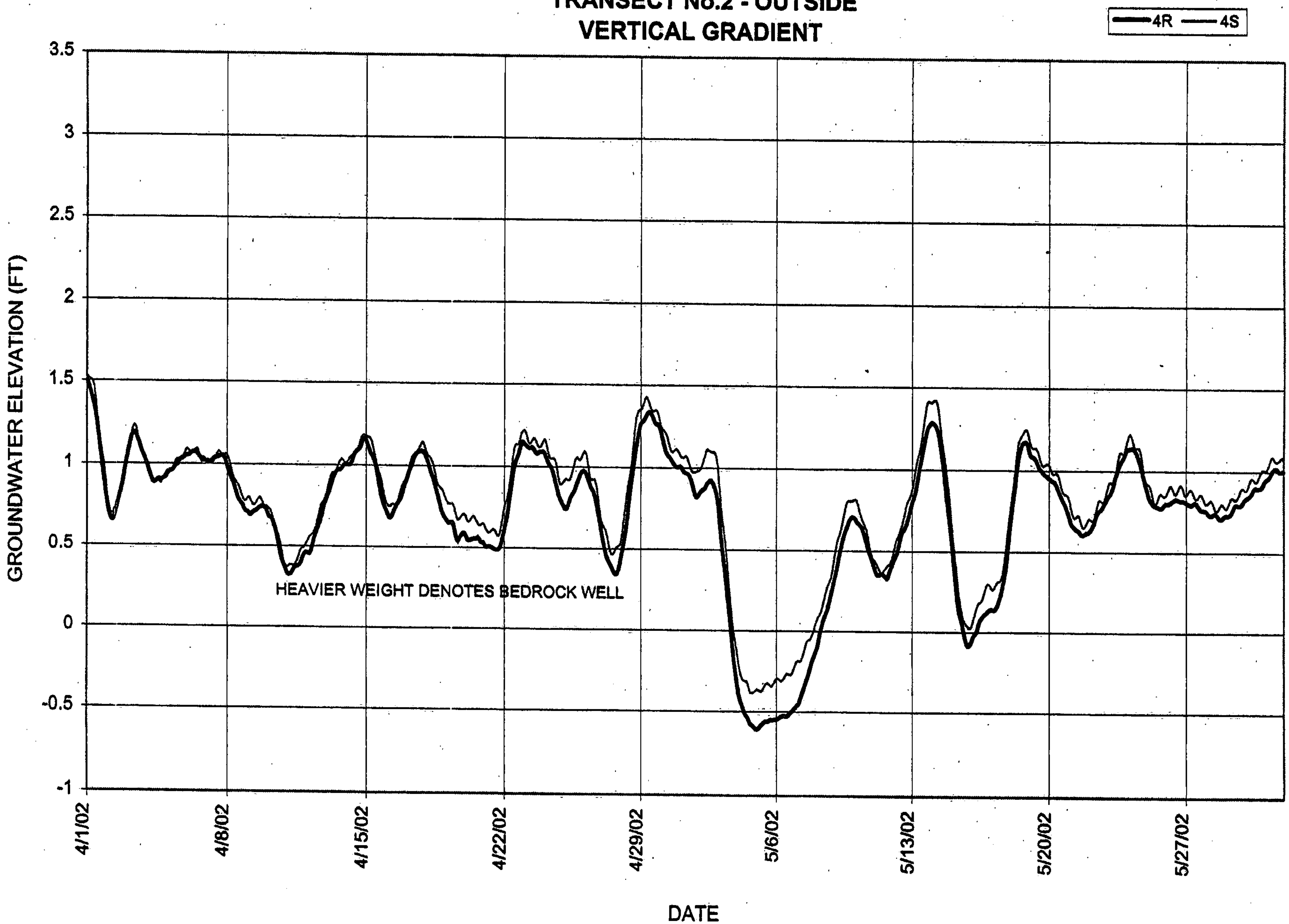
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #11
TRANSECT No.2 - OUTSIDE
VERTICAL GRADIENT



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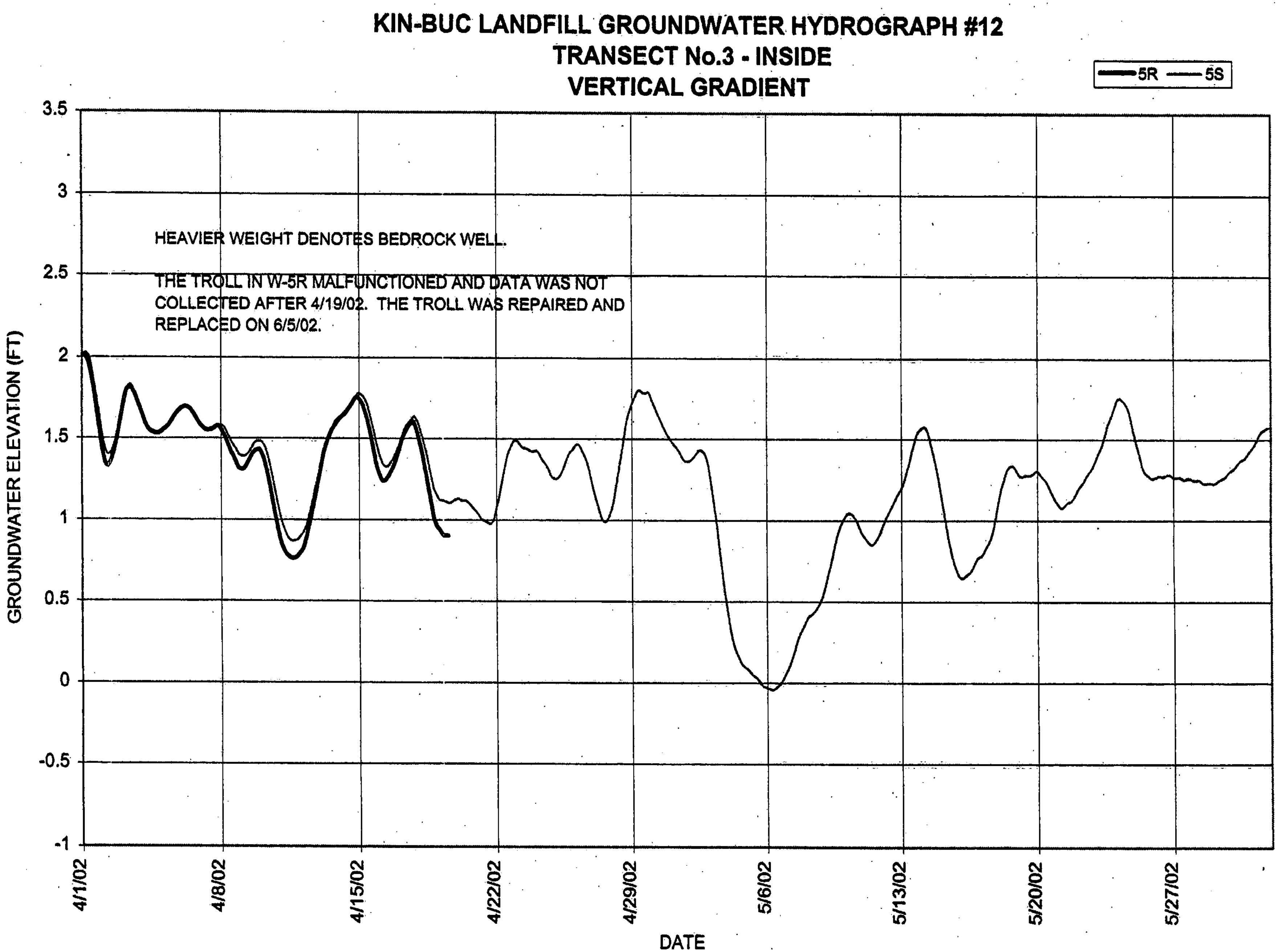

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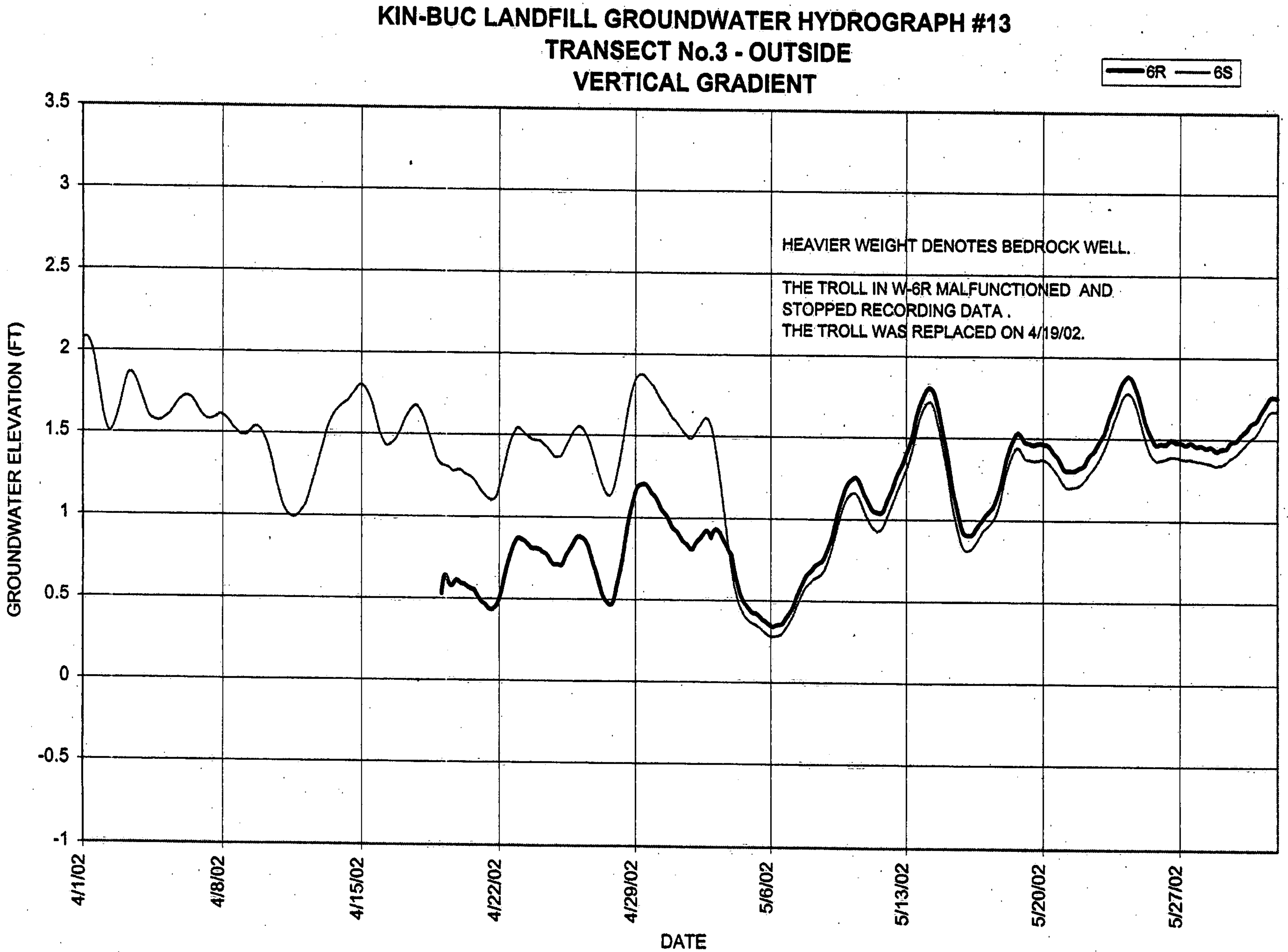

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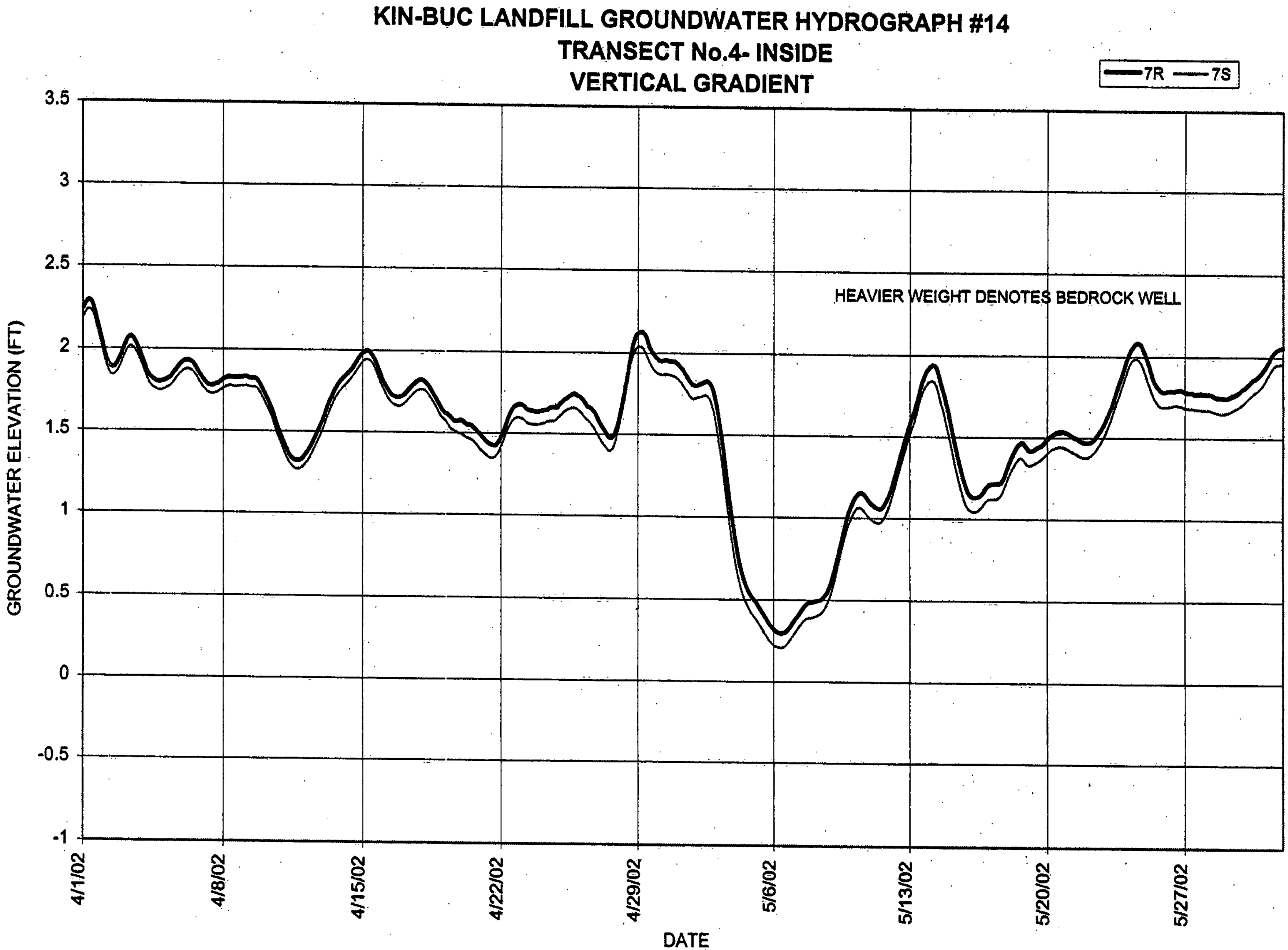

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KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #15
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VERTICAL GRADIENT

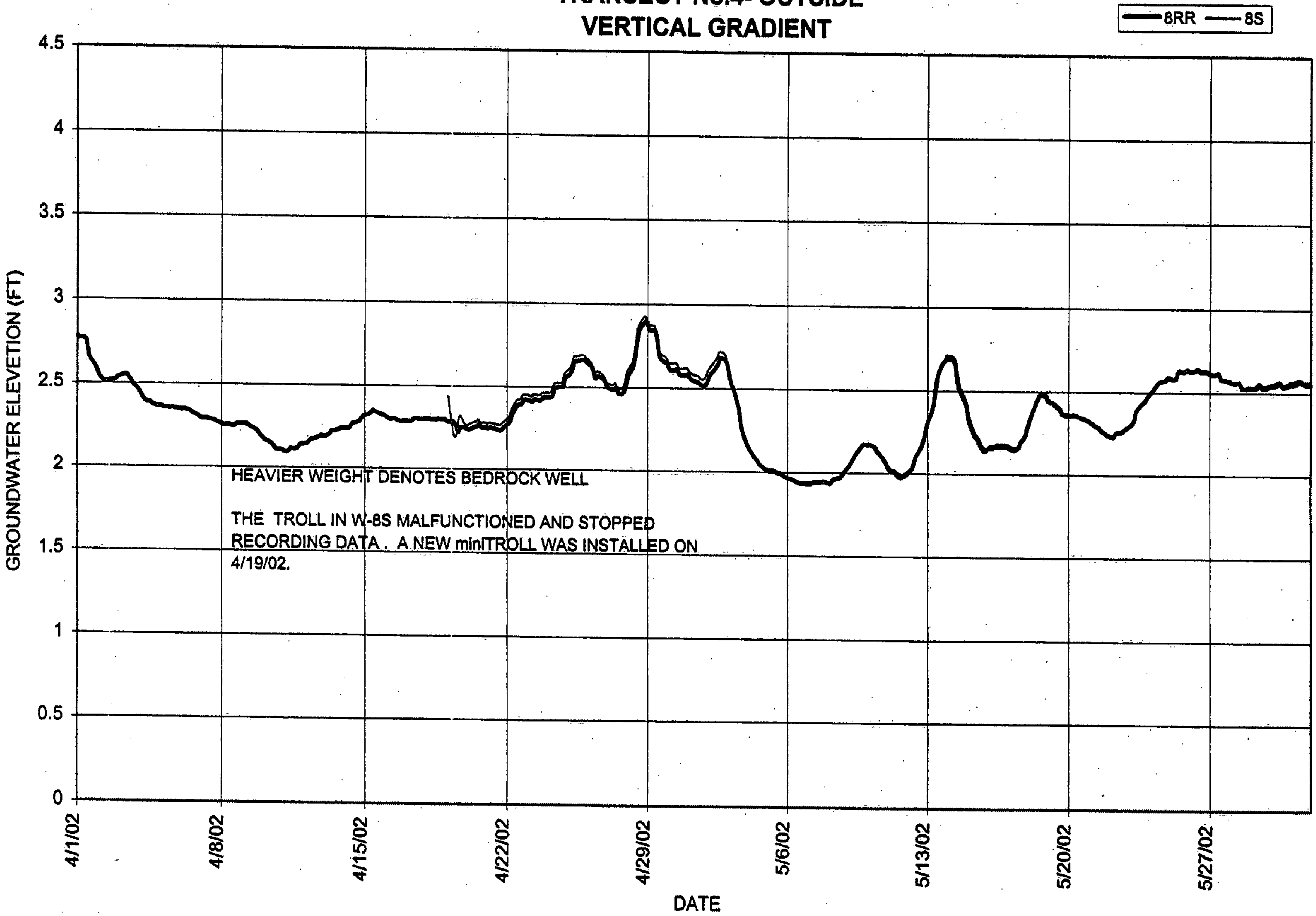

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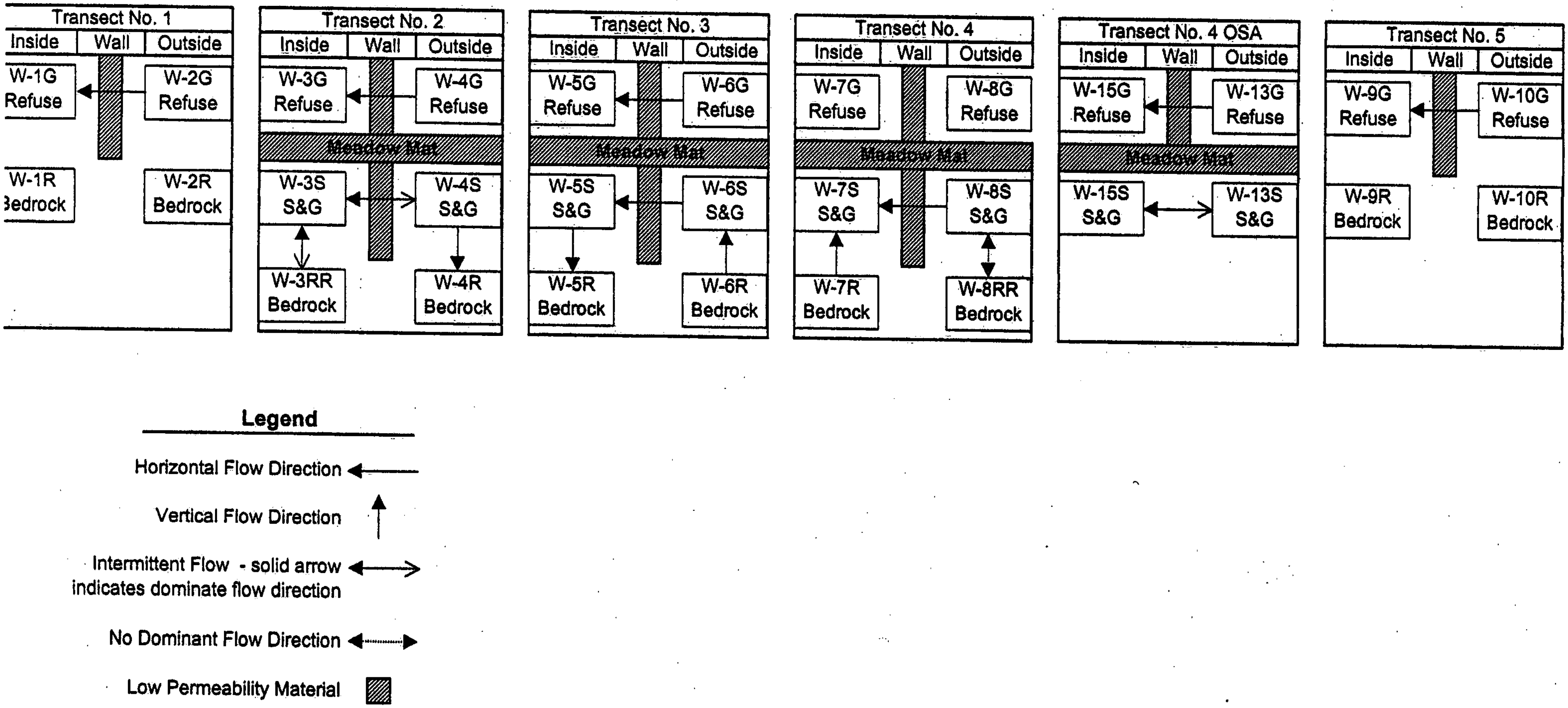
Figure 1
Kin-Buc Landfill
Hydraulic Profile Summary
May 2002



n://proj/kinbuc/quartrptbls/2nd-01/Figure1 hydrolic profile2002

Shaw Environmental & Infrastructure, Inc.

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Shaw The Shaw Group Inc.

June 18, 2002
Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, New Jersey 08817

Re: Hydraulic Control at OU1

Dear Mr. Januszkiewicz:

During January-February 2000 aquifer testing was performed at the Kin-Buc landfill site to better define the hydrogeologic flow conditions within OU1, with particular emphasis on the sand and gravel and bedrock unit and to determine the optimal extraction scenario required to demonstrate hydraulic containment. In July 2000, IT Corporation prepared a Groundwater Pumping Well Performance Evaluation Report. The major conclusions of the evaluation were as follows:

- Hydraulic control of OU-1 could be achieved by pumping sand and gravel well No. 2 (S&G-2) at 21.5 gallons per minute but indicated that considerably lower pumping rates could achieve the same objective.
- Flow rates can be minimized and the lateral extent of groundwater capture can be maximized by maintaining 2 pumping centers, S&G-2 and S&G-3.
- Hydraulic control of OU1 can be optimized by pumping S&G-2 at 10,000 gpd and S&G-3 at 5,000 gpd for a combined daily extraction rate of 15,000 gpd.
- Hydraulic control of OU1 to be evaluated on an annual basis, and flow rates adjusted if necessary to achieve hydraulic control of OU1.

As you are aware, the consistent attainment of intragradient conditions, in particular within the sand and gravel unit, at Transect No 2 has not been achievable. On June 12, 2002, a meeting was held at the site with U.S. Filter and MWO Environmental Engineering & Consulting, P.C. to discuss the hydraulic performance of OU1. Based on our discussions, and in keeping with the recommendation to annually evaluate the pumping and performance at OU1, the following course of action is proposed.

Groundwater extraction at S&G-2 will be increased to a consistent pumping rate of approximately 15 gpm while the pumping rate at S&G-3 will be maintained at

approximately 6 gpm. This rate should be maintained to the extent feasible based on steady state pumping, 24 hours/day, 7 days per week. It is recommended that this pumping schedule be maintained for a minimum 2 week period to achieve stabilization of groundwater conditions. If hydraulic control is maintained than consideration can be given to proportionately reducing the pumping rates to determine if hydraulic control can be maintained at lower rates. While these rates are twice those recommended to achieve hydraulic control in the aquifer test, it would be appropriate to assess conditions at the higher rates recommended herein, and scale back the pumping accordingly, based on the results of the hydraulic monitoring.

The above recommendations assume that pumping rates should be maintained on a consistent basis since the premise of the hydrogeologic analysis in terms of hydraulic control assumes continuous (24 hour per day) pumping.

If you have any questions, please do not hesitate to call.

Sincerely,

SHAW ENVIRONMENTAL AND INFRASTRUCTURE

Steven Goldberg

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Attachments

cc: Glenn Grieb, US Filter
Michael O'Hara, MWO Engineering
Adam Licardi/Michael Schumaci, EMCON/OWT

Steve G.

EMCON/OWT, Inc.

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July 26, 2002
Project 791186

FILE COPY

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for June 2002

Dear Mr. Januszkiewicz:

A site visit was completed on July 8, 2002 to download water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of June 2002 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by mid August.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. The continuous water level elevation data when compared with manual readings indicated that the miniTrolls are functioning properly and are recording accurate data with the exceptions of W-5R and W-15S. The Troll in Well 5R malfunctioned and was sent back to In-Situ for warranty repairs and has since been replaced. Due to the malfunction with the miniTroll in W-5R, there is a gap in the data from April 19, 2002 to June 5, 2002. The miniTroll in Well 15S malfunctioned and stopped collecting data on June 23, 2002. The Troll was pulled and a rental miniTroll was placed in the well on July 19, 2002. It should be noted that due to complications with the programming of the new data loggers, miniTrolls in wells W-1G, W-2G, W-3G, W-6G, W-6R, W-8S, and W-15S did not start collecting data until April 19, 2002.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference.

The water levels in wells on the outside of the slurry wall vary significantly over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 shows the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Transect 1

Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were not observed during the month of June. The average monthly water elevation for June at Well 1G (inside) and Well 2G (outside) was 11.07 and 10.65 feet msl, respectively. The straight line on the hydrograph indicates the well was dry. The manual water elevations and the hydrograph indicate that Wells 1G and 2G were dry during the month.

Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 2, and indicate that the leachate collection system is functioning properly. The fact that the leachate collection system is functioning properly suggests that intragradient conditions are being maintained at Transect 1, even though water levels in Wells 1G and 2G do not indicate this condition.

Transect 2

Refuse (3G/4G)/Hydrograph No. 2 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of June at Well 3G (inside) and Well 4G (outside) was 9.84 and 11.17 feet msl, respectively.

Sand and Gravel (3S/4S)/Hydrograph No. 6 - Intragradient conditions were not consistently maintained throughout the month. The average monthly water elevations for the month of June at Well 3S (inside) and Well 4S (outside) was 1.06 and 1.00 feet msl, respectively.

Vertical Gradient (3S/3RR)-Inside/Hydrograph No. 10 – Upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units inside the slurry wall for the month. The average monthly water elevation for the month of June at Well 3S (sand & gravel) and Well 3RR (bedrock) was 1.06 and 0.85 feet msl, respectively.

Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 – Upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month. The average monthly water elevation for the month of June at Well 4S (sand & gravel) and 4R (bedrock) was 1.00 and 0.96 feet msl, respectively. The difference in average monthly water elevations was less than 0.2 feet.

Transect 3

Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of June at Well 5G (inside) and Well 6G (outside) was 10.03 and 13.06 feet msl, respectively.

Sand and Gravel (5S/6S)/Hydrograph No. 7 – Slight intragradient conditions were maintained throughout the month. Well 5S (inside) and Well 6S (outside) was 1.56 and 1.62 feet msl, respectively. The difference in average monthly water elevations was less than 0.2 feet.

Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units inside the slurry wall. The automatic data recorder for well 5R, inside the wall, malfunctioned and data was not collected between April 19, 2002 and June 5, 2002. The average monthly water elevation for the month of June at Well 5S (sand & gravel) and Well 5R (bedrock) was 1.56 and 1.55 feet msl, respectively.

Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Slight Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month. The average monthly water elevation for the month of June at Well 6S (sand & gravel) and Well 6R (bedrock) was 1.62 and 1.72 feet msl, respectively.

Transect 4

Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of June at Well 15G (inside) and Well 13G (outside) was 1.40 and 6.73 feet msl, respectively.

Sand and Gravel (7S/8S)/Hydrograph No. 8 - Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of June at Well 7S (inside) and Well 8S (outside) was 1.84 and 2.46 feet msl, respectively.

Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 - Intragradient conditions were not consistently maintained throughout the month. Due to an upward gradient between the sand & gravel and refuse units in the oil seeps area, groundwater was not collected from the sand & gravel unit. Water levels from Well W-15G in the refuse unit are included on the hydrograph for comparison. The average monthly water elevation for the month of June at Well 15S (inside) and

Well 13S (outside) was 2.41 and 2.30 feet msl, respectively. It should be noted that the Troll data logger in Well 15S malfunctioned and stopped collecting data on June 23, 2002. The Troll was pulled and a rental miniTroll was placed in the well on July 19, 2002.

Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month. The average monthly water elevation for the month of June at Well 7S (sand & gravel) and Well 7R (bedrock) was 1.84 and 1.94 feet msl, respectively. The difference in average monthly water elevations was less than 0.2 feet.

Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month. The average monthly water elevation for the month of June at both Well 8S (sand & gravel) and Well 8RR (bedrock) was 2.46 and 2.52 feet msl, respectively. The difference in average monthly water elevations was less than 0.2 feet.

Transect 5

Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month. The average monthly water elevation for the month of May at Well 9G (inside) and Well 10G (outside) was 7.45 and 8.34 feet msl, respectively.

Figure 1 shows the hydraulic profile summary for June 2002.

Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from June 1 to June 30, 2002:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
0 gal.	457,022 gal.	142,181 gal.	0 gal.	48,626 gal.
0 gpd	15,234 gpd	4,739 gpd	0 gpd	1,621 gpd

For the period, a total of 599,203 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 19,973 gpd. The extraction rate from S&G No. 2 was 15,234 gpd, and the extraction rate from S&G No. 3 was 4,739 gpd. The leachate extraction rate of 1,621 gpd was above the recommended rate of 1,500 gpd.

CONCLUSIONS

- Intragradient conditions were maintained in the refuse unit at Transects 2, 3, 4, and 5.

- Intragradient conditions were not indicated by the monitoring wells in the refuse unit at Transect 1, although levels in the leachate collection system indicate intragradient conditions are present at this location.

- Intragradient conditions were maintained in the sand & gravel unit at Transects 3 and 4. Intragradient conditions were not consistently observed in the sand & gravel unit at Transect 2 and in the sand & gravel oil seeps area unit at Transect 4.

- Inside the slurry wall, upward gradient conditions were not observed between the bedrock and overlying sand & gravel unit at Transect 2 and 3. A slight upward gradient condition was observed at Transect 4 between the bedrock and overlying sand & gravel unit.

- Outside the slurry wall, upward gradient conditions were not observed between the bedrock and overlying sand & gravel unit at Transect 2. Slight upward gradient conditions were observed at Transect 3 and 4 between the bedrock and overlying sand & gravel units.

RECOMMENDATIONS

- The leachate collection rate should continue to be maintained at approximately 1,500 gpd.

- Pursuant to our letter of June 18, 2002 (see attached), pumping rates of S&G-2 and S&G-3 will be consistently maintained at approximately 15 gpm and 6 gpm, respectively, to determine if hydraulic control can be maintained. The groundwater elevation data will be evaluated to determine the effectiveness of the new pumping regime on achieving consistent hydraulic control.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

Sincerely,

EMCON/OWT, INC.

Steven Goldberg

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

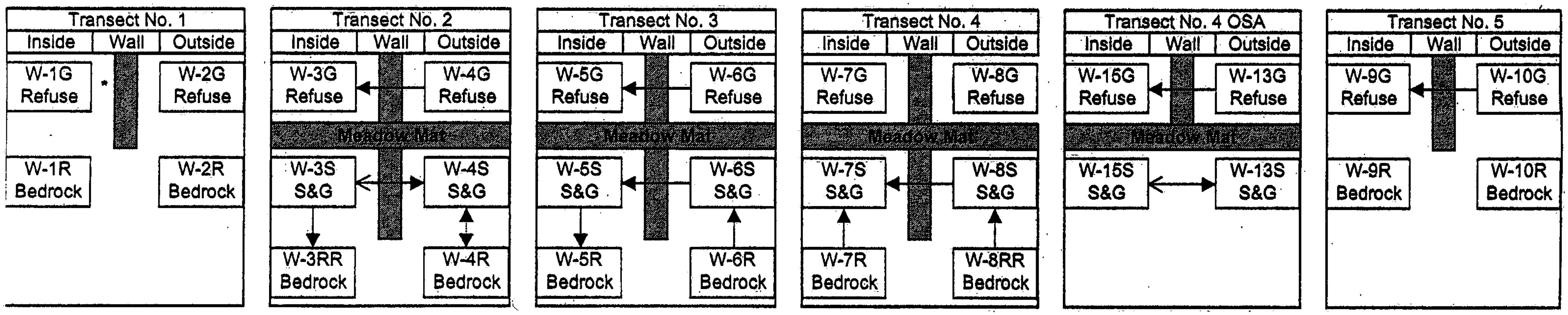
Adam Licardi /ajs

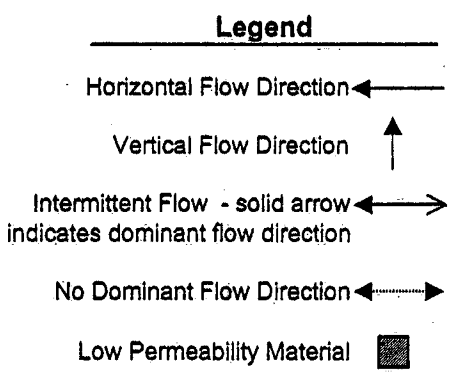
Adam J. Licardi
Environmental Scientist

Attachments

cc: Glenn Grieb, US Filter

Figure 1
Kin-Buc Landfill
Hydraulic Profile Summary
June 2002





NOTE: * The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in well W-1G do not indicate this condition.

n://proj/kinbuc/quartrptbls/2nd-01/Figure1 hydrolic profile2002

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2002 Minimum/Maximum Water Elevations
Second Quarter

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-1G	April	11.07	11.16	11.07	W-2G	April	10.57	10.58	10.58
	May	11.07	11.08	11.07		May	10.57	13.72	12.30
	June	11.07	11.07	11.07		June	10.49	11.46	10.65
	2nd qtr	11.07	11.16	11.07		2nd qtr	10.49	13.72	11.35
W-3G	April	9.74	10.24	9.93	W-4G	April	10.88	11.32	11.16
	May	9.59	10.14	9.84		May	10.93	11.51	11.22
	June	9.56	10.02	9.84		June	10.79	11.54	11.17
	2nd qtr	9.56	10.24	9.85		2nd qtr	10.79	11.54	11.19
W-3S	April	-0.13	1.96	0.92	W-4S	April	-0.41	2.44	0.92
	May	-2.51	1.58	0.02		May	-0.90	2.26	0.65
	June	0.12	1.88	1.06		June	-0.27	2.57	1.00
	2nd qtr	-2.51	1.96	0.66		2nd qtr	-0.90	2.57	0.86
W-5G	April	9.85	10.59	10.16	W-6G	April	12.85	13.70	13.24
	May	9.76	10.53	10.10		May	12.84	13.87	13.39
	June	9.81	10.28	10.03		June	12.68	13.48	13.06
	2nd qtr	9.76	10.59	10.10		2nd qtr	12.68	13.87	13.23
W-5S	April	0.78	2.27	1.43	W-6S	April	0.86	2.34	1.51
	May	-0.14	1.93	1.04		May	0.17	2.01	1.18
	June	0.77	2.34	1.56		June	0.89	2.43	1.62
	2nd qtr	-0.14	2.34	1.34		2nd qtr	0.17	2.43	1.43
W-7S	April	1.21	2.37	1.69	W-8S	April	2.01	4.45	2.53
	May	0.15	2.12	1.30		May	1.67	4.09	2.33
	June	1.23	2.47	1.84		June	1.85	4.48	2.46
	2nd qtr	0.15	2.47	1.61		2nd qtr	1.67	4.48	2.42
W-15S	April	1.71	3.15	2.14	W-13S	April	1.63	3.48	2.15
	May	1.33	3.10	2.06		May	1.45	3.01	2.05
	June 1 - 23	1.34	3.37	2.41		June	1.77	3.55	2.30
	2nd qtr	1.33	3.37	2.20		2nd qtr	1.45	3.55	2.17
W-15G	April	1.31	1.50	1.41	W-13G	April	6.52	7.03	6.70
	May	1.27	1.50	1.40		May	6.49	7.01	6.73
	June	1.32	1.51	1.44		June	6.36	6.80	6.59
	2nd qtr	1.27	1.51	1.42		2nd qtr	6.36	7.03	6.67
W-9G	April	7.16	7.48	7.33	W-10G	April	8.02	8.19	8.12
	May	6.95	7.46	7.18		May	8.07	8.25	8.16
	June	7.27	7.63	7.45		June	8.24	8.42	8.34
	2nd qtr	6.95	7.63	7.32		2nd qtr	8.02	8.42	8.21

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KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2002 Minimum/Maximum Water Elevations
Second Quarter

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-3RR	April	-0.31	3.35	1.77	W-4R	April	-0.70	2.50	0.86
	May	-1.91	1.78	0.21		May	-1.23	2.18	0.55
	June	-0.34	2.15	0.85		June	-0.44	2.57	0.96
	2nd qtr	-1.91	3.35	0.93		2nd qtr	-1.23	2.57	0.79
W-5R	April	0.65	2.26	1.43	W-6R	April	0.28	1.43	0.77
	May	NA (1.)	NA (1.)	0.61 (2.)		May	0.25	2.06	1.21
	June	0.71	2.31	1.55		June	1.01	2.50	1.72
	2nd qtr	0.65	2.31	1.50		2nd qtr	0.25	2.50	1.35
W-7R	April	1.27	2.41	1.76	W-8RR	April	1.84	4.41	2.38
	May	0.24	2.22	1.39		May	1.67	4.08	2.33
	June	1.34	2.58	1.94		June	1.92	4.53	2.52
	2nd qtr	0.24	2.58	1.69		2nd qtr	1.67	4.53	2.41

Note: 1. Troll malfunctioned, data was not collected
2. Water elevation calculated from manual water levels.

Table 2
Kin-Buc Landfill
Leachate Cleanout Monitoring
2002

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.14		10.11		9.93		9.90		na		na
DATE												
12/10/01	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/02	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/02	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/02	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/02	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/02	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/02	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/02	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na

Shaw Environmental & Infrastructure, Inc.

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Shaw The Shaw Group Inc.

June 18, 2002
Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, New Jersey 08817

Re: Hydraulic Control at OU1

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- Hydraulic control of OU-1 could be achieved by pumping sand and gravel well No. 2 (S&G-2) at 21.5 gallons per minute but indicated that considerably lower pumping rates could achieve the same objective.
- Flow rates can be minimized and the lateral extent of groundwater capture can be maximized by maintaining 2 pumping centers, S&G-2 and S&G-3.
- Hydraulic control of OU1 can be optimized by pumping S&G-2 at 10,000 gpd and S&G-3 at 5,000 gpd for a combined daily extraction rate of 15,000 gpd.
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As you are aware, the consistent attainment of intragradient conditions, in particular within the sand and gravel unit, at Transect No 2 has not been achievable. On June 12, 2002, a meeting was held at the site with U.S. Filter and MWO Environmental Engineering & Consulting, P.C. to discuss the hydraulic performance of OU1. Based on our discussions, and in keeping with the recommendation to annually evaluate the pumping and performance at OU1, the following course of action is proposed.

Groundwater extraction at S&G-2 will be increased to a consistent pumping rate of approximately 15 gpm while the pumping rate at S&G-3 will be maintained at

approximately 6 gpm. This rate should be maintained to the extent feasible based on steady state pumping, 24 hours/day, 7 days per week. It is recommended that this pumping schedule be maintained for a minimum 2 week period to achieve stabilization of groundwater conditions. If hydraulic control is maintained than consideration can be given to proportionately reducing the pumping rates to determine if hydraulic control can be maintained at lower rates. While these rates are twice those recommended to achieve hydraulic control in the aquifer test, it would be appropriate to assess conditions at the higher rates recommended herein, and scale back the pumping accordingly, based on the results of the hydraulic monitoring.

The above recommendations assume that pumping rates should be maintained on a consistent basis since the premise of the hydrogeologic analysis in terms of hydraulic control assumes continuous (24 hour per day) pumping.

If you have any questions, please do not hesitate to call.

Sincerely,

SHAW ENVIRONMENTAL AND INFRASTRUCTURE

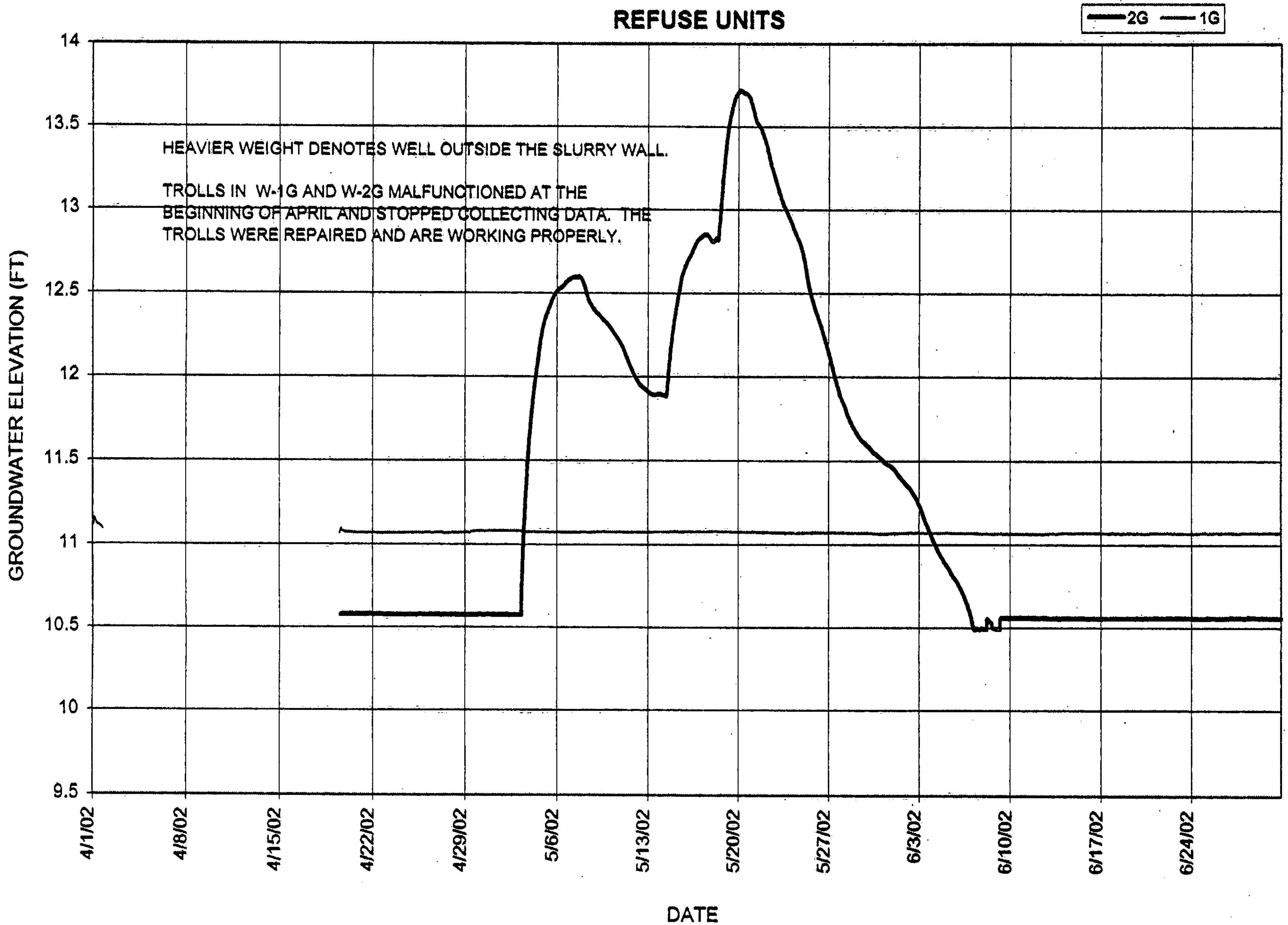
Steven Goldberg

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Attachments

cc: Glenn Grieb, US Filter
Michael O'Hara, MWO Engineering
Adam Licardi/Michael Schumaci, EMCON/OWT

KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #1
TRANSECT No. 1
REFUSE UNITS



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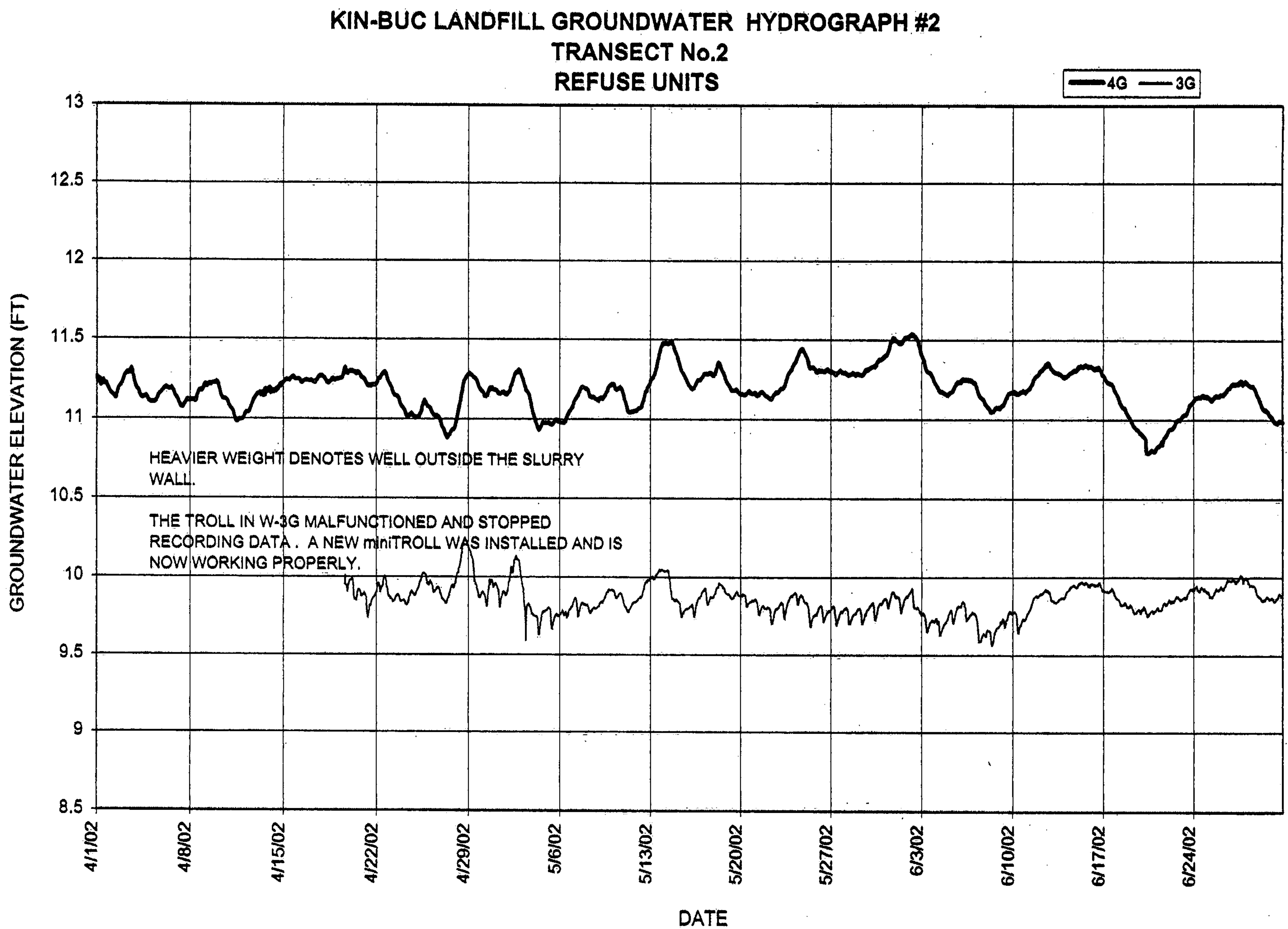

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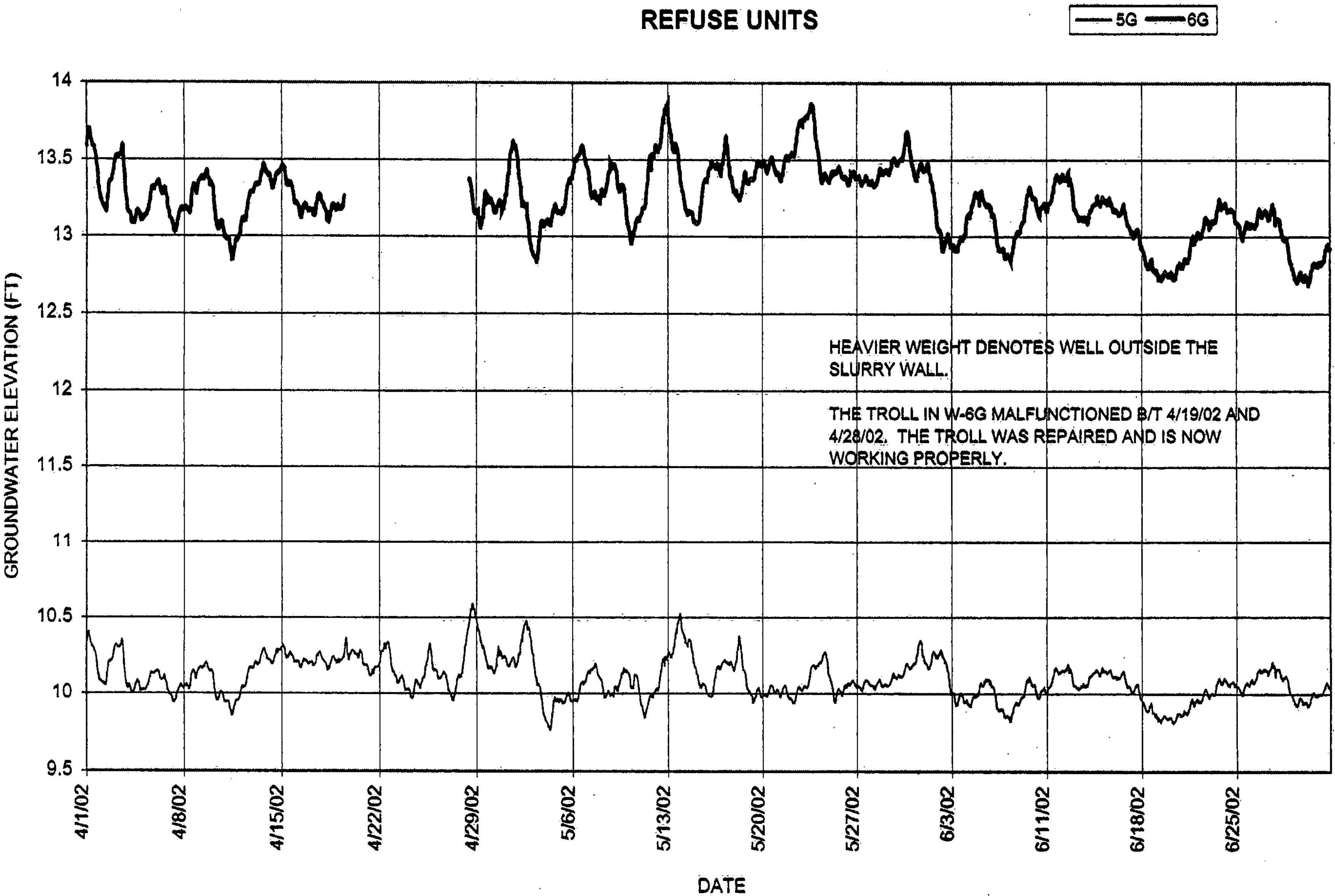
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH # 3
TRANSECT No.3
REFUSE UNITS



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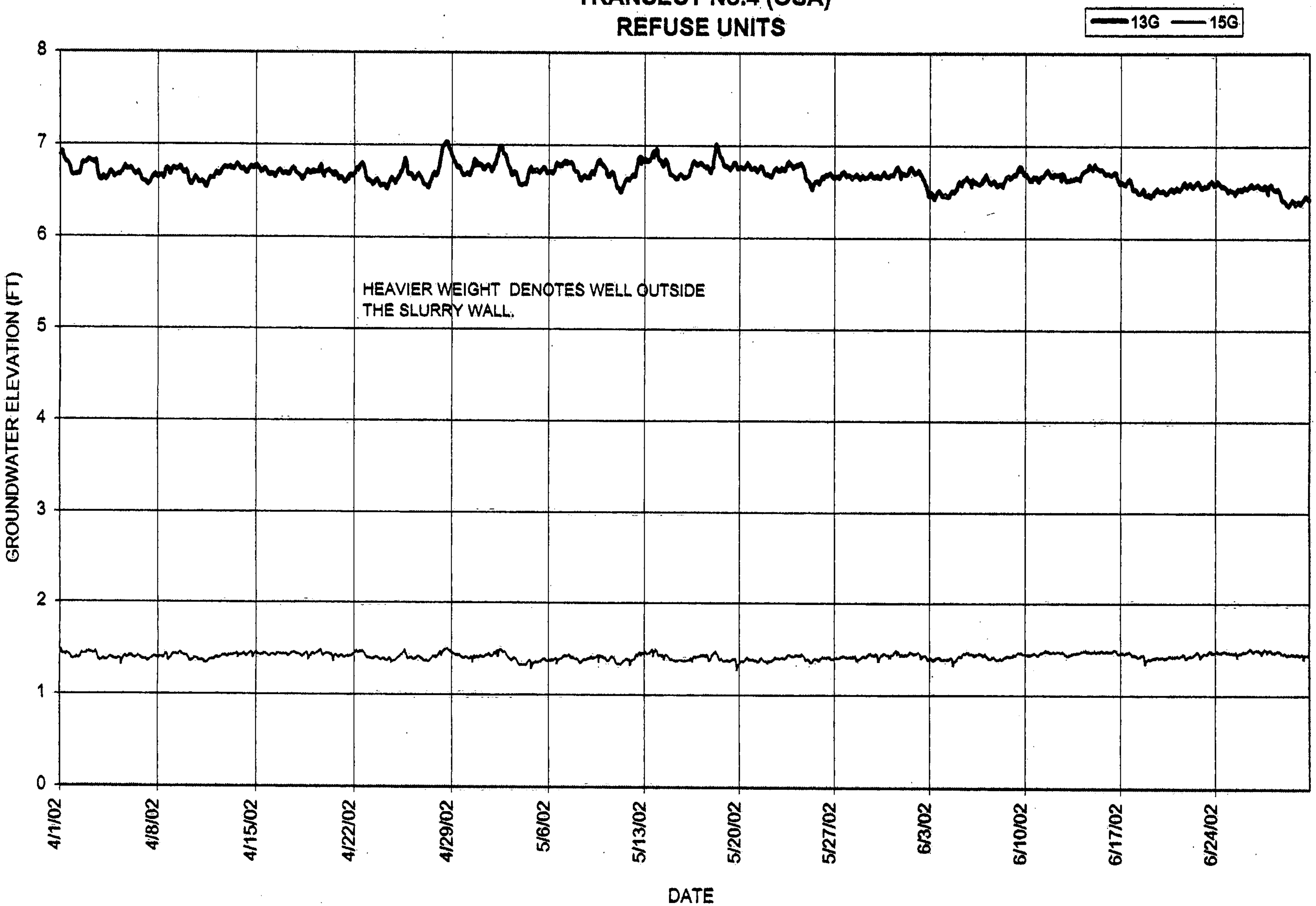
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #4
TRANSECT No.4 (OSA)
REFUSE UNITS



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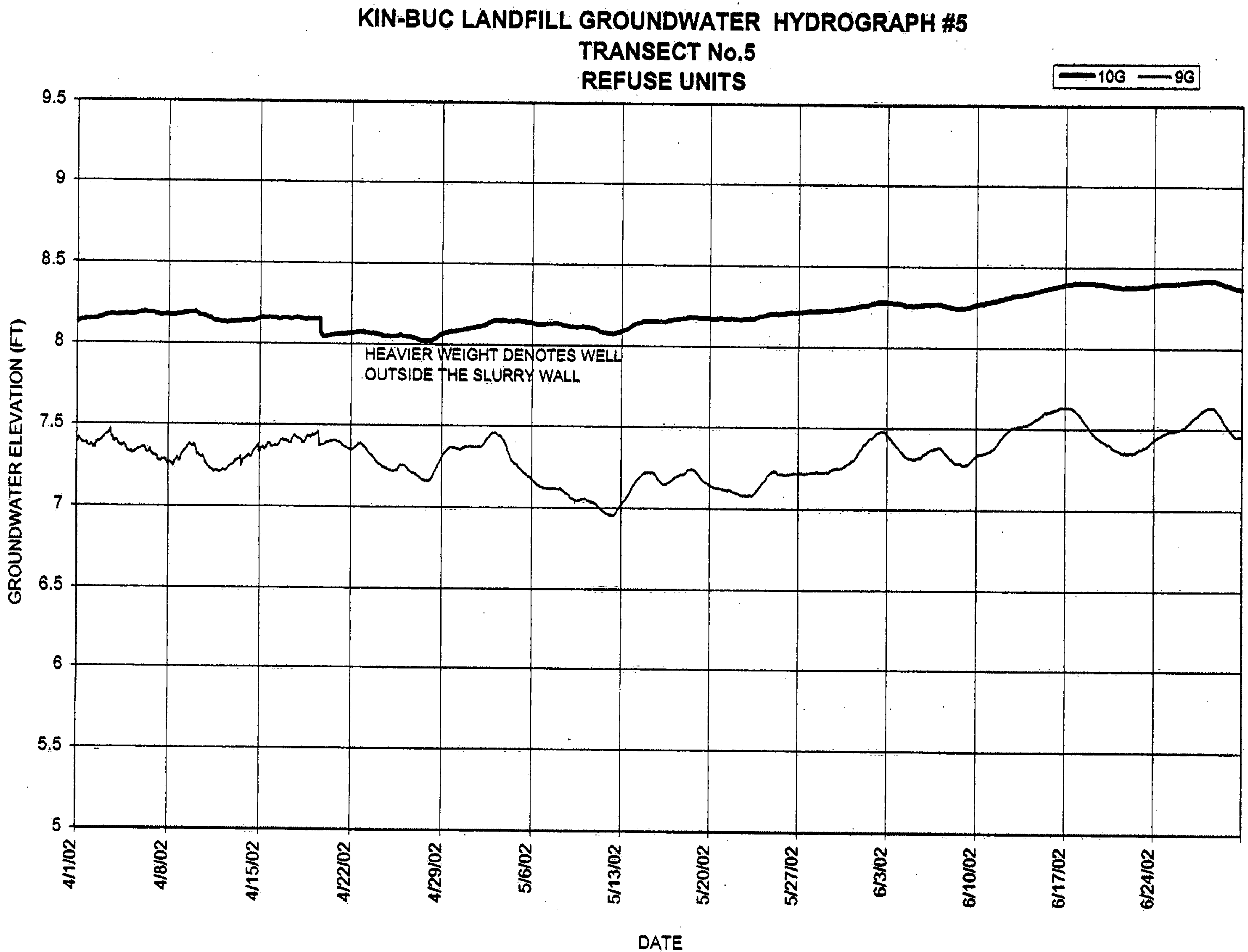

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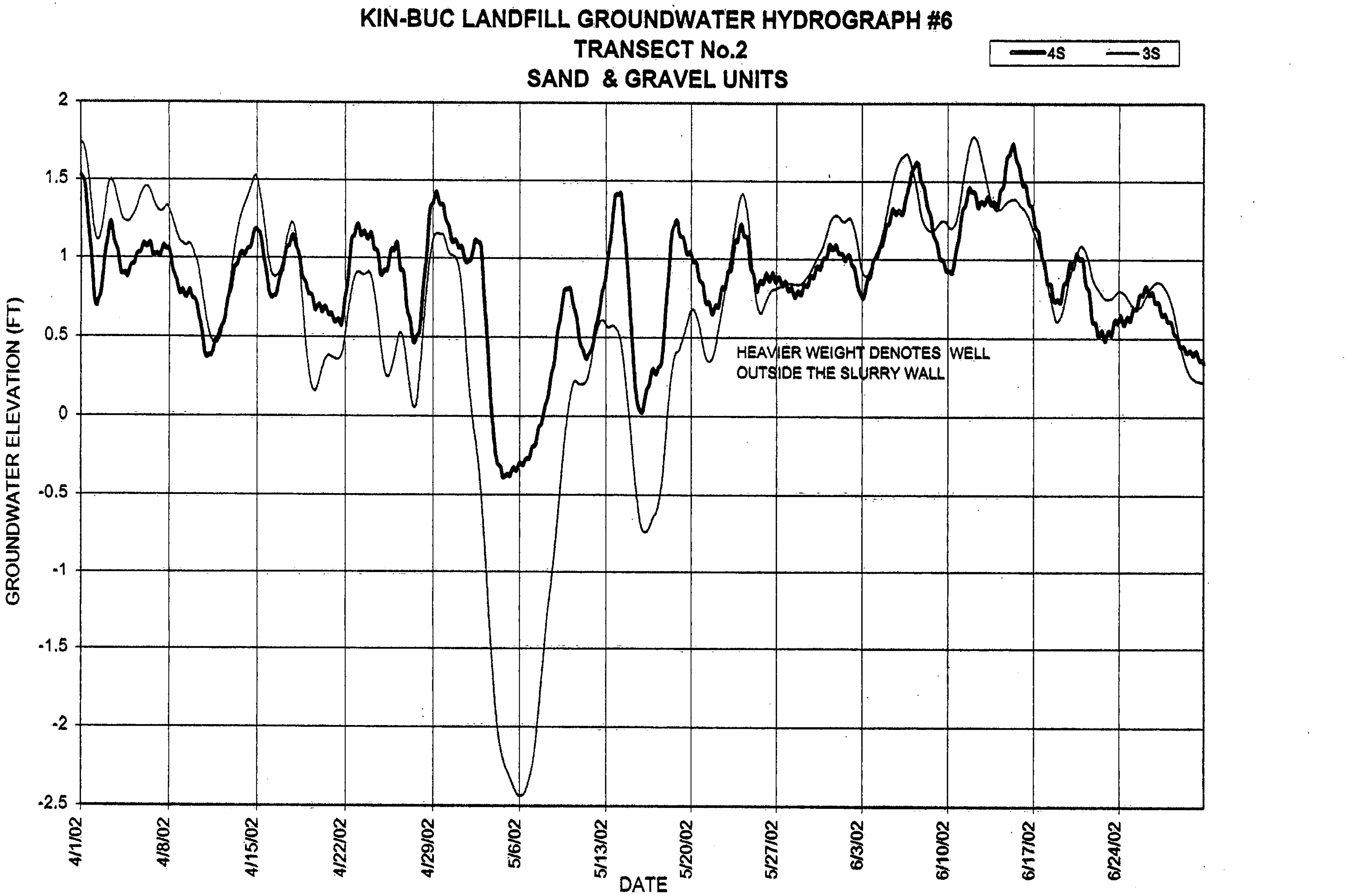

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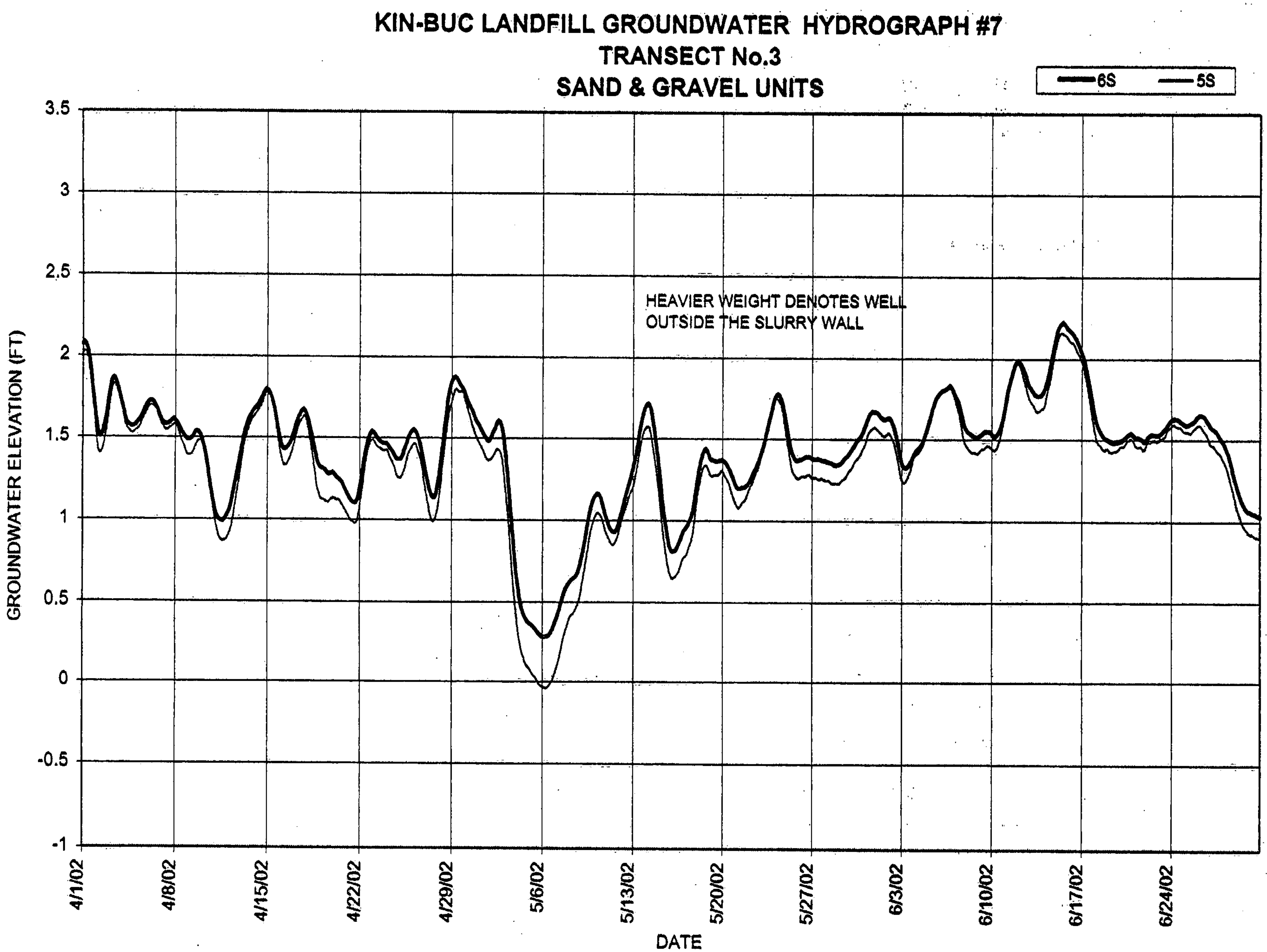

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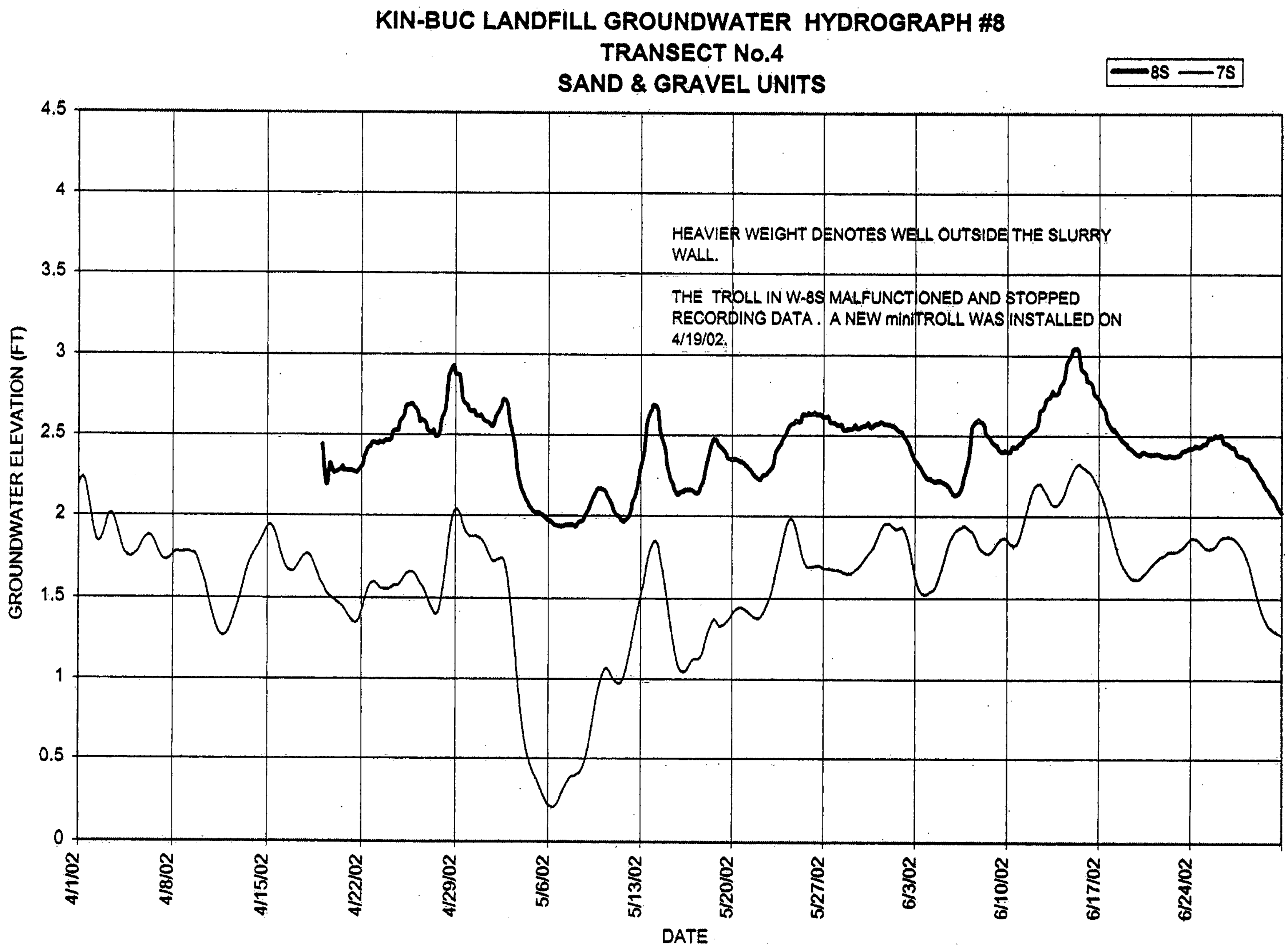

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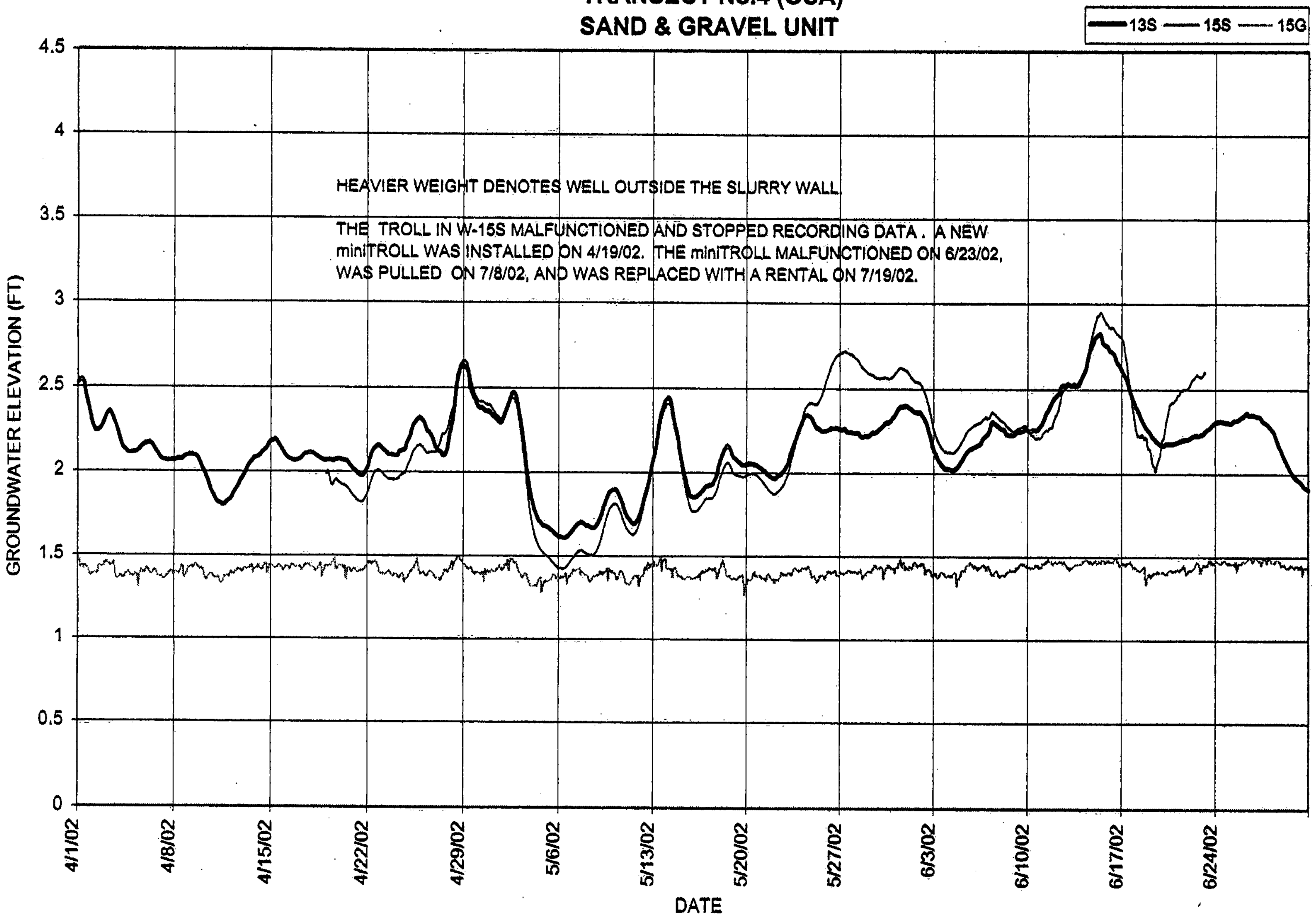
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #9
TRANSECT No.4 (OSA)
SAND & GRAVEL UNIT



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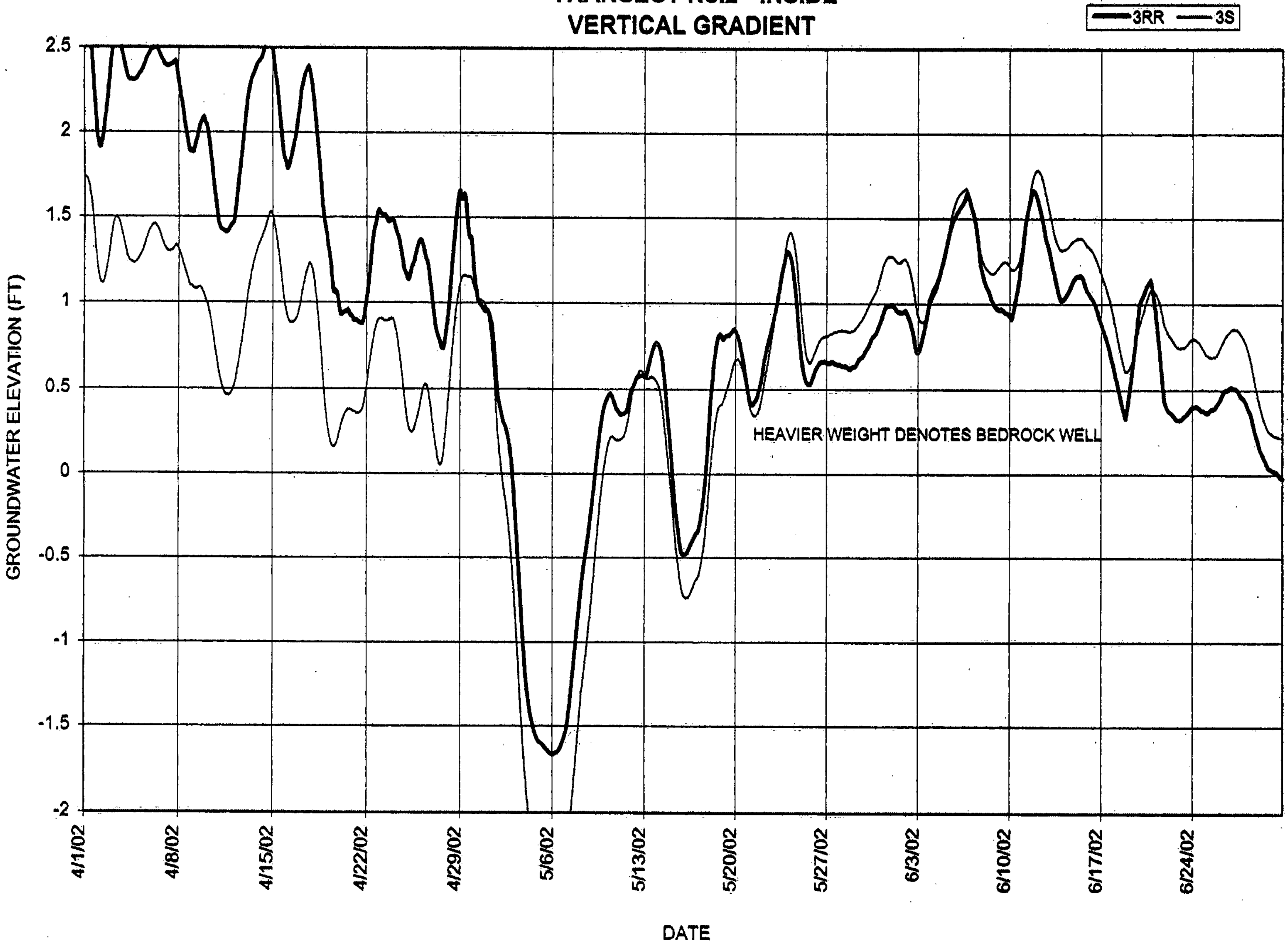
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #10
TRANSECT No.2 - INSIDE
VERTICAL GRADIENT



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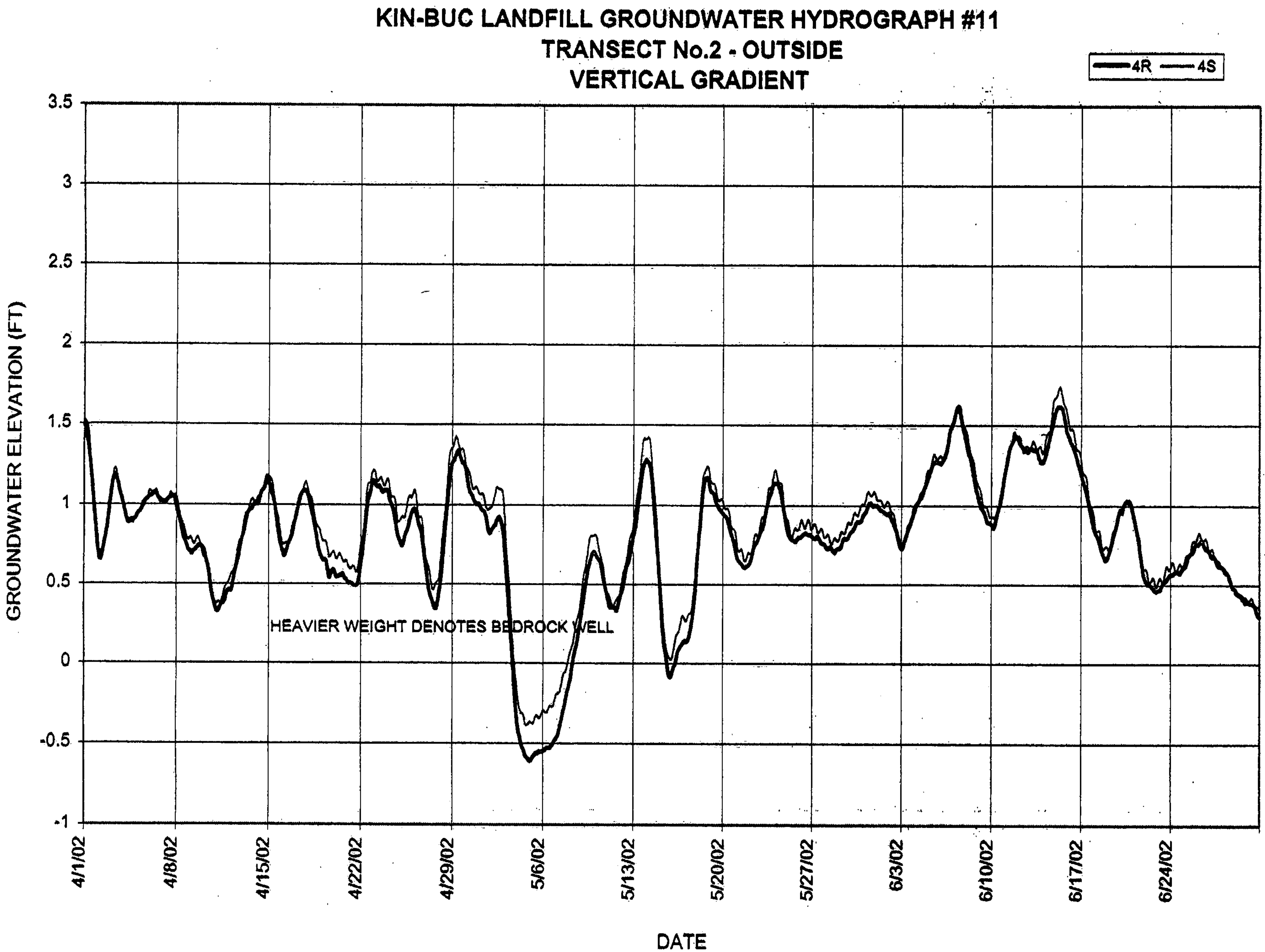

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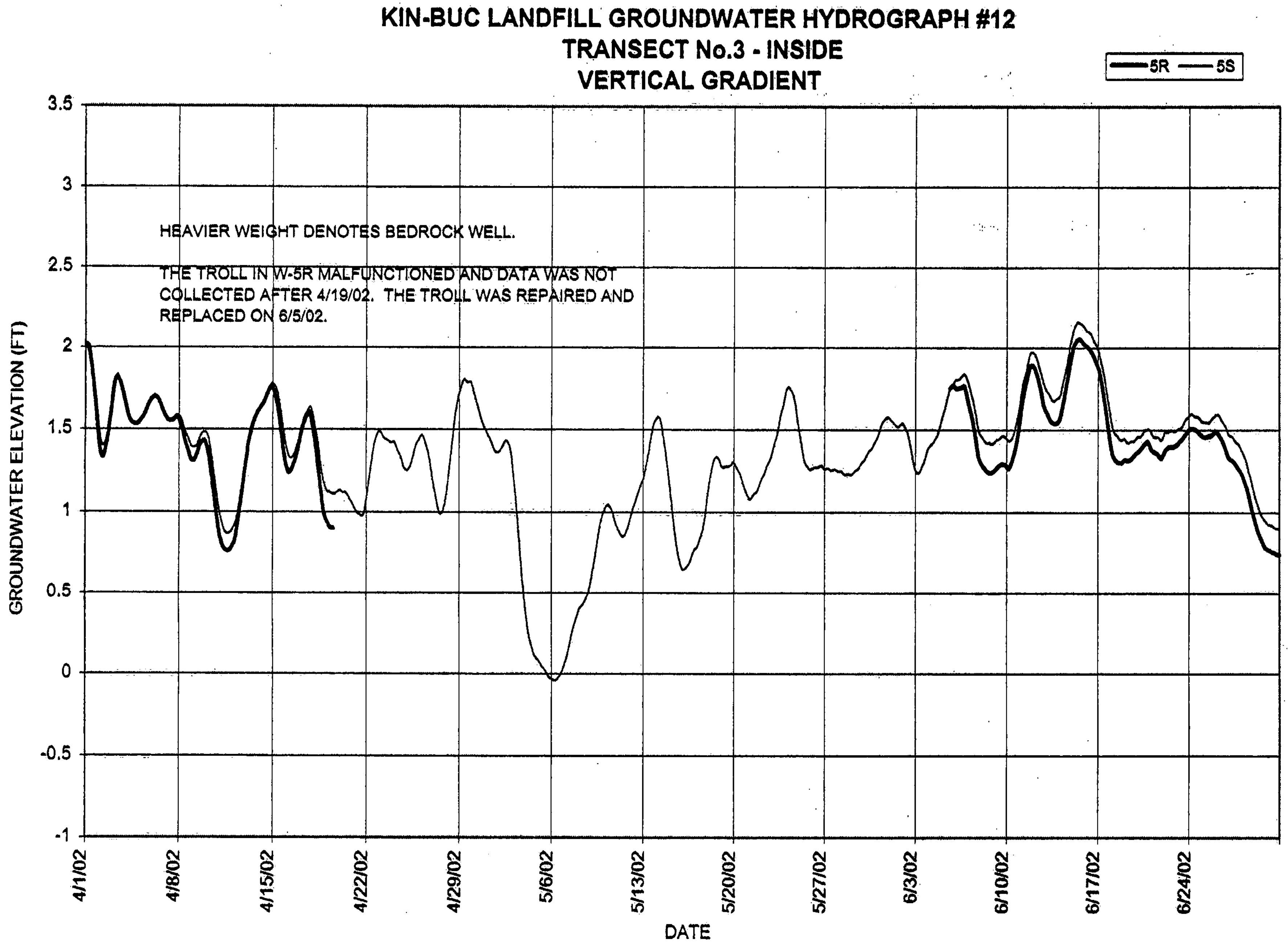

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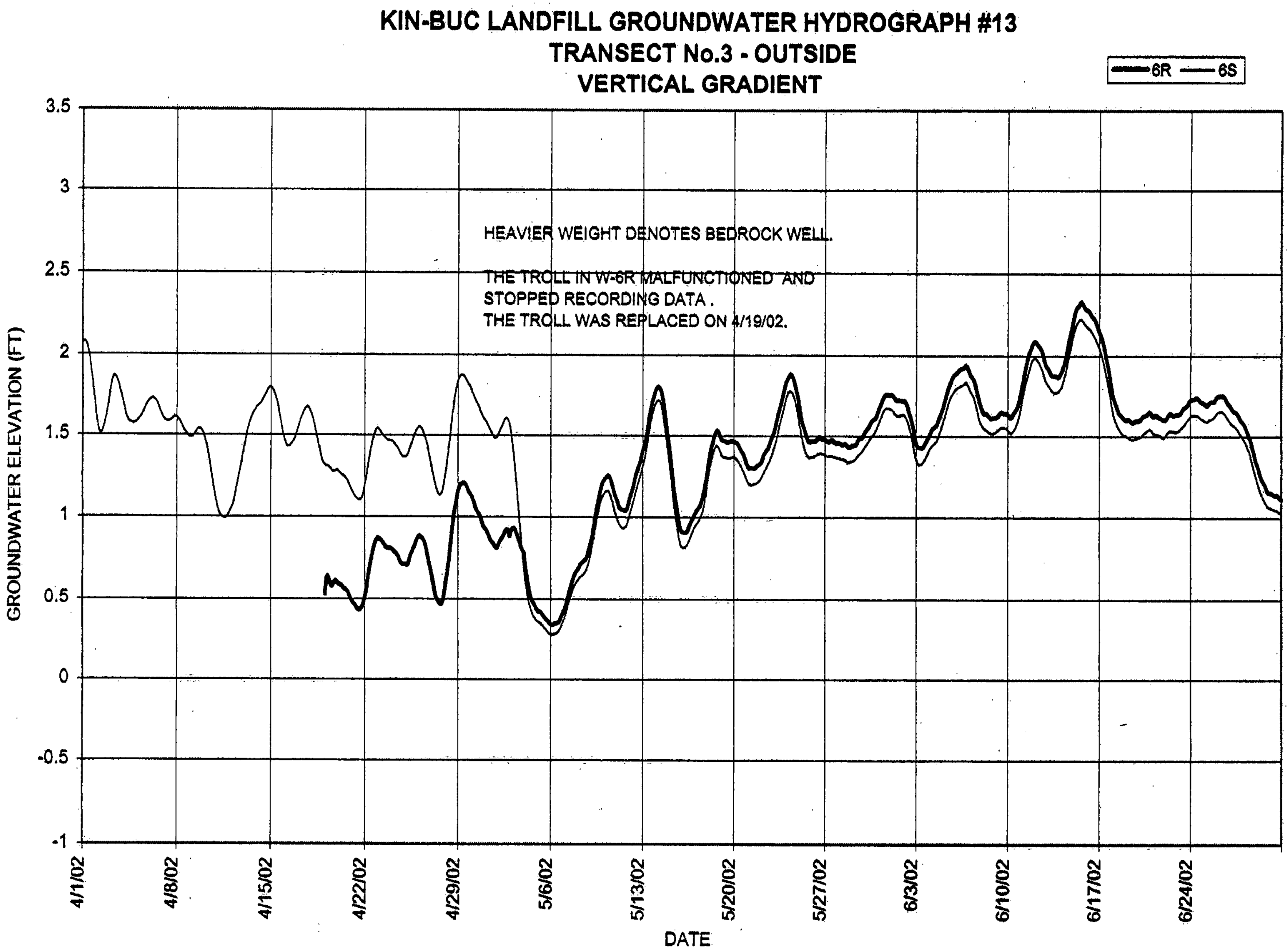

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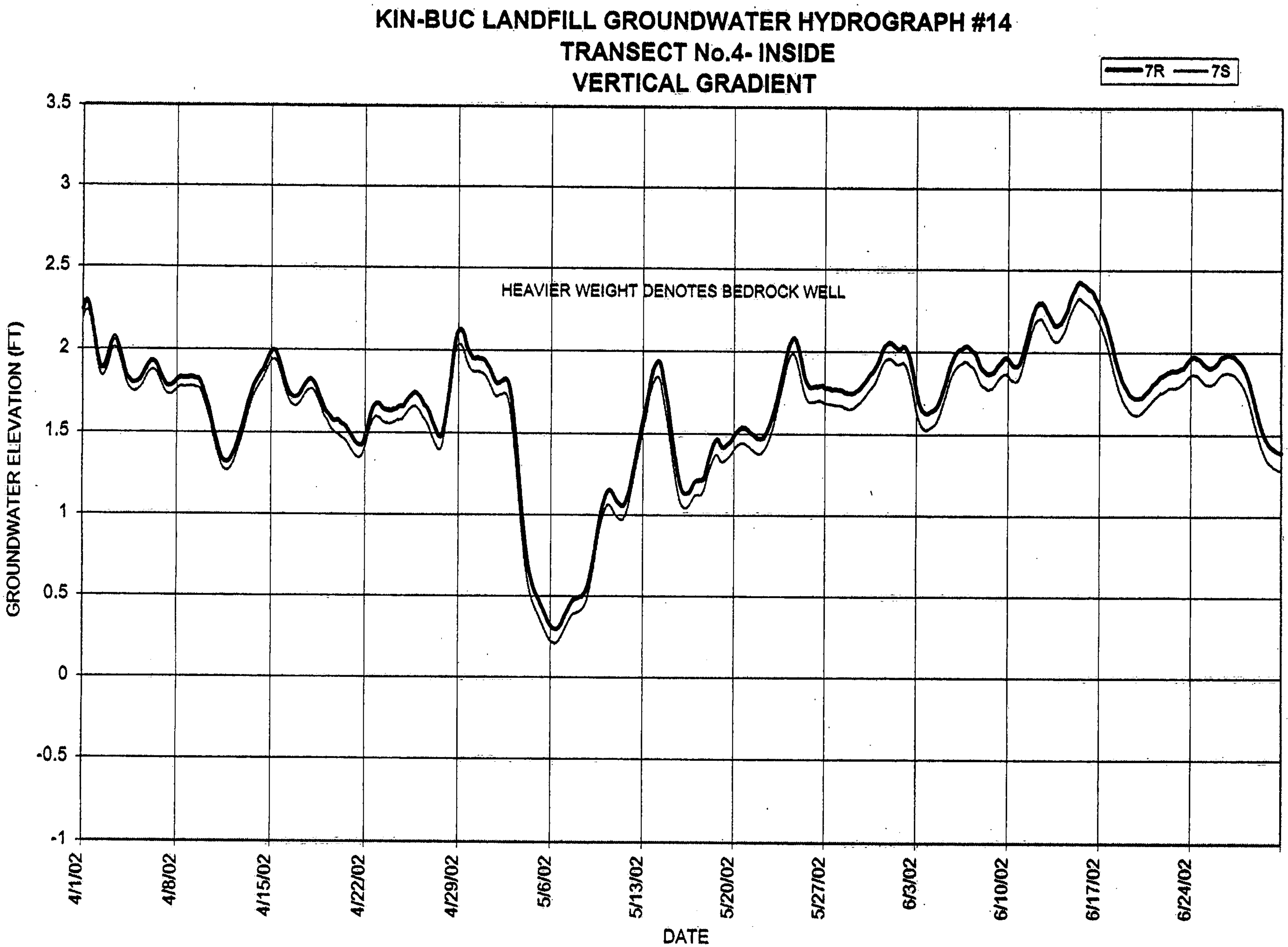

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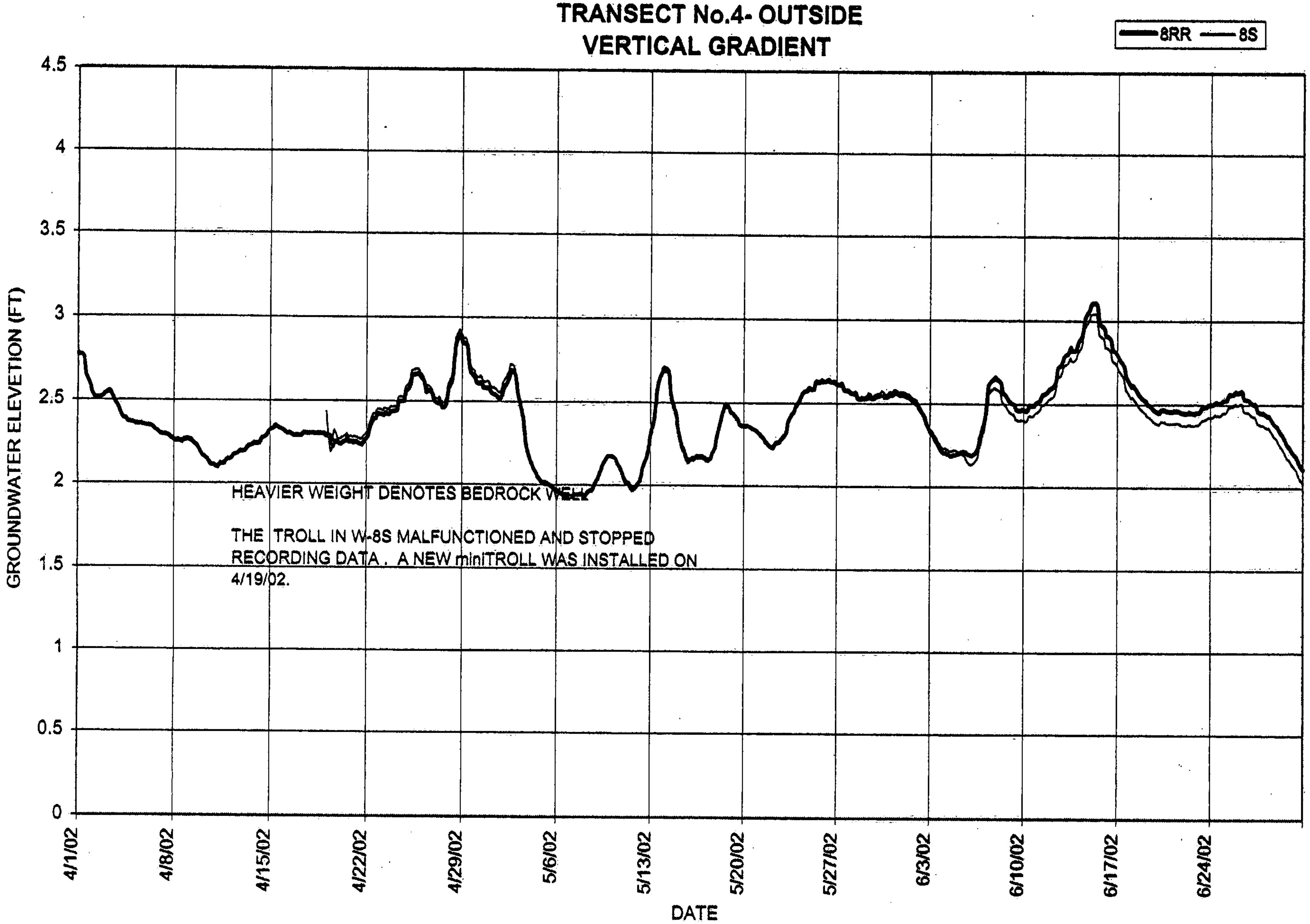
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #15
TRANSECT No.4- OUTSIDE
VERTICAL GRADIENT



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